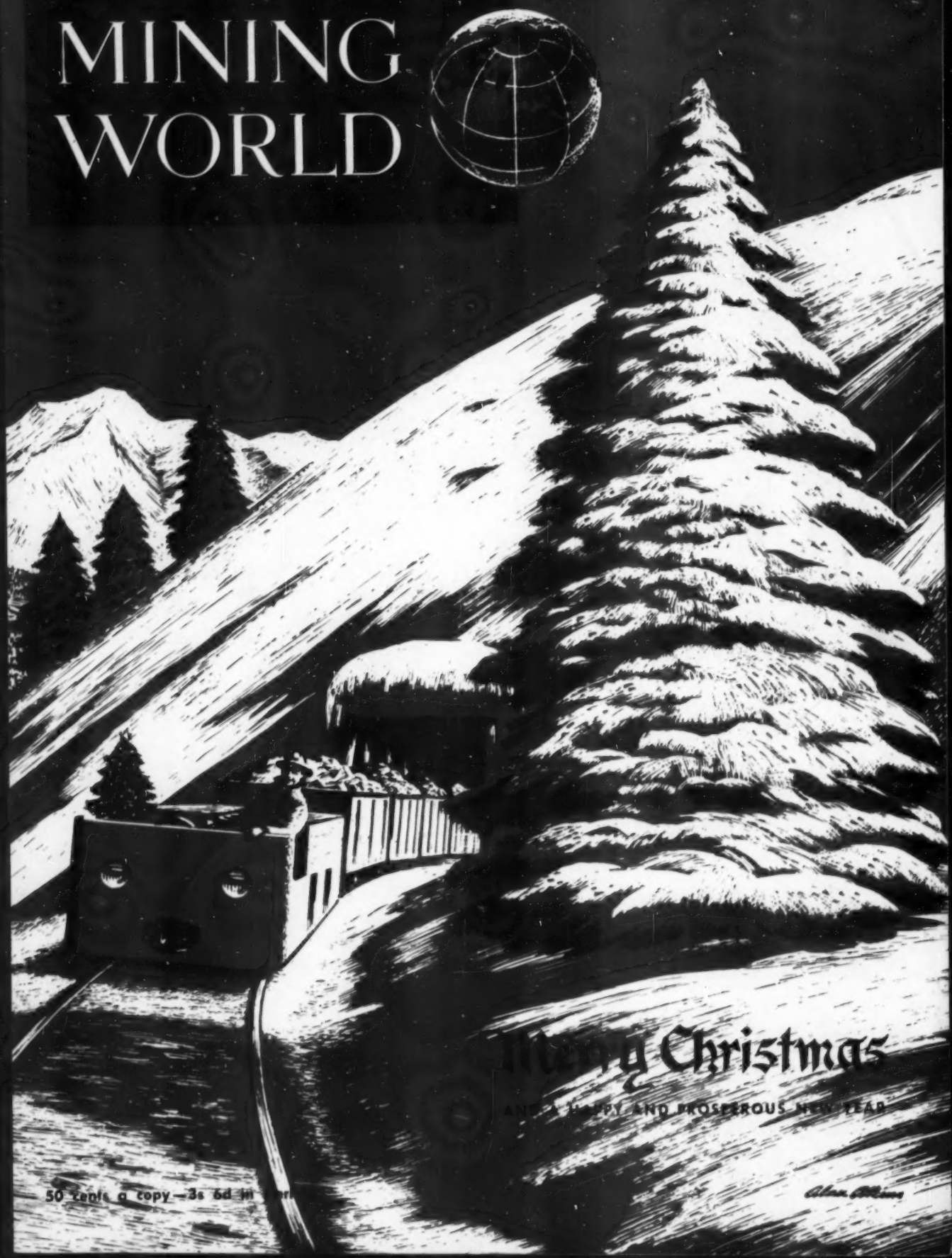
December 1956 VOL. 18, NO. 12

MINING WORLD



50 cents a copy—3s 6d in

12 84" WEMCO S-H CLASSIFIERS

chosen by the White Pine Copper Company

One of 12 Wemco S-H Classifiers installed by White Pine Copper Co. at White Pine, Michigan following testing in their company pilot plant. Mining and processing operations for this large project were designed and engineered by the Western Knapp Engineering Company, division of Western Machinery Company.

With annual production of 75 million pounds, White Pine ranks as one of the most important copper projects developed. To serve as a vital part of the primary grinding circuit, White Pine selected twelve 84" Wemco S-H Classifiers. Typical of the magnitude of this project is the fact that these 84" units are the world's largest simplex classifiers.

Six pairs of Wemco S-H Classifiers are operated in closed circuit with six ball mills, 12' 6" x 13' in size. The minerals recovered are chalcocite and minor amounts of native copper occurring in sandstone and shale deposits. Each classifier is of the submerged spiral type of design with 84" double ribbon, variable pitch spiral. Inside tank length totals 41' 9". Operating slope is 3½" per foot.

Each classifier has sand raking loads up to 8000 TPD and overflows feed to flotation at rates up to 1200 TPD. Classifier overflow ranges between 30 and 35% solids (depending on degree of pulp flocculation). Screen analysis of this overflow shows between 2 and 8% plus 100 mesh.

Whether your classifier needs are large or small WEMCO DESIGN offers you these METALLURGICAL AND MECHANICAL ADVANTAGES

- **Greater Overflow Capacity** — up to 25% more effective pool area.
- **Greater Raking Capacity** — up to 100% greater sand conveying capacity.
- **Sharper Separation** — less oversize in the overflow and less undersize in the sands.
- **Greater Mechanical Strength** — through Wemco-pioneered large diameter shafts.
- **Balanced Performance** — various models with a wide choice of tanks and spirals achieve correct performance under any condition.
- **Better Drainage** — drier sand for easier conveying and close-circuiting.

Put Wemco to work on your classification problems. Write today for current literature and additional information. No cost or obligation.

WKE

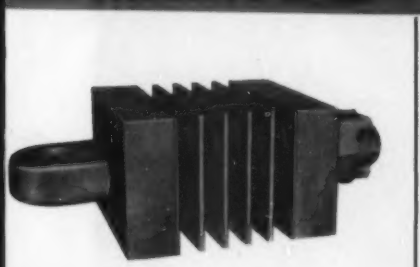
WESTERN KNAPP ENGINEERING CO.
a division of . . .

WEMCO
WESTERN MACHINERY COMPANY

650-B Fifth Street • San Francisco 7, Calif.

Representatives in principal cities of the United States and Canada and in major countries throughout the world.

Still another large underground mine equips with **NATIONAL** devices



NATIONAL RI-230-3 RUBBER CUSHIONING DEVICES ARE USED BY CANADIAN JOHNS-MANVILLE MINE CARS TO ABSORB VERTICAL AND END TO END SHOCKS.

WILLISON AUTOMATIC COUPLERS COUPLE AT EITHER END OF CAR OR LOCOMOTIVE, REQUIRE NO MANUAL ASSISTANCE.

The Granby-type cars used in the new operations of Canadian Johns-Manville's Matheson, Ontario, mine are being equipped with National devices . . . as are the cars used in the company's Asbestos, Quebec, operation. These two operations are installing Willison Automatic Couplers and National rubber cushioning devices.

NATIONAL MALLEABLE and STEEL **CASTINGS COMPANY**

ESTABLISHED 1868

CLEVELAND 6, OHIO

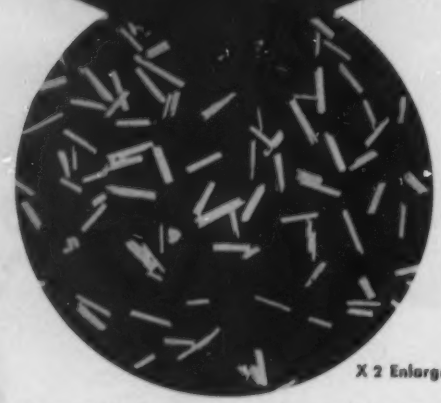
CANADIAN SUBSIDIARY
NATIONAL MALLEABLE AND STEEL CASTINGS COMPANY OF CANADA, LTD.
128 SIMCOE ST., TORONTO 1, ONTARIO

WILLISON AUTOMATIC COUPLERS
RUBBER CUSHIONED UNITS
MINE AND INDUSTRIAL CAR TRUCKS
NACO STEEL WHEELS
NACO STEEL LINKS
and SWIVEL HITCHINGS

you ...con

WESTVACO SODA ASH

F... !



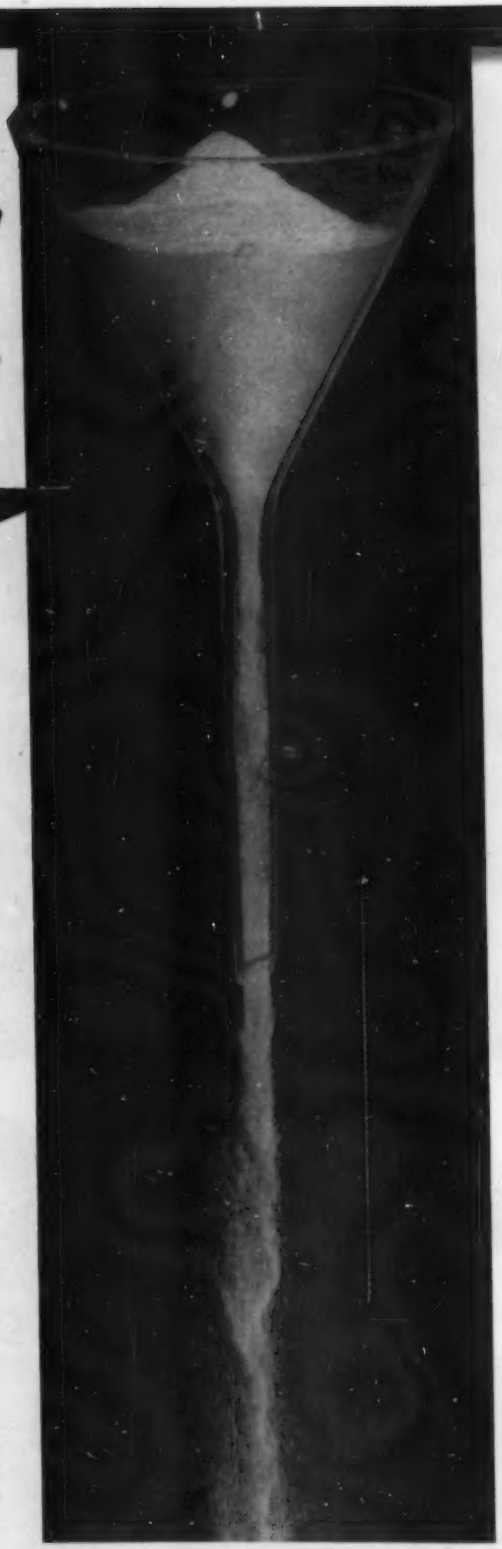
X 2 Enlargement

The photomicrograph above of a grab-sample from a typical carload clearly shows the long needle-like crystal structure of WESTVACO Soda Ash . . . the reason why it flows so freely through the funnel . . . why it is so easy and clean to handle.

Notice also that regardless of particle size, the needle-like crystal shape predominates. That's important because needle-shaped crystals just don't agglomorate into globs and cake up during handling, storage and processing operations.

Chemical properties of WESTVACO Soda Ash are equally excellent. Purity — 99.8% Na_2CO_3 — 58.40% Na_2O. Low iron, calcium, salt and sulfate. Ammonia-free. Just about everything anyone could ask for in hydrometallurgical, smelting and refining uses.

If you use soda ash anywhere from the Mississippi Valley to the Panhandle to the Pacific, you should be using WESTVACO Soda Ash. May we ship a sample and quote your needs?



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FOOD MACHINERY AND CHEMICAL CORPORATION

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fmc FOOD MACHINERY AND CHEMICAL CORPORATION

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Mining World

Including the Export Edition **WORLD MINING**

Published monthly except in April when publication is semi-monthly

VOLUME 18 **DECEMBER 1956** NO. 13

OPERATIONS—TECHNOLOGY

IN THE NEWS

DEPARTMENTS

PUBLISHING OFFICE: Emmett St., Bristol, Conn.

EDITORIAL AND EXECUTIVE OFFICES
500 Howard St., San Francisco 5, Calif., EXbrook 7-1881

General Manager ..... M. F. Holsinger
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Dist. Mrg., New York .... A. E. Roberts
Dist. Mgr., Chicago ..... R. N. Crosby
Assoc. Ed., Vancouver . Charles L. Shaw

BRANCH OFFICES: New York 17-370 Lexington Ave., Murray Hill 3-9295, Chicago 26—1791 Howard, Rogers Park 4-3420. Vancouver, B.C.—402 Pender St. West, MArine 7287.

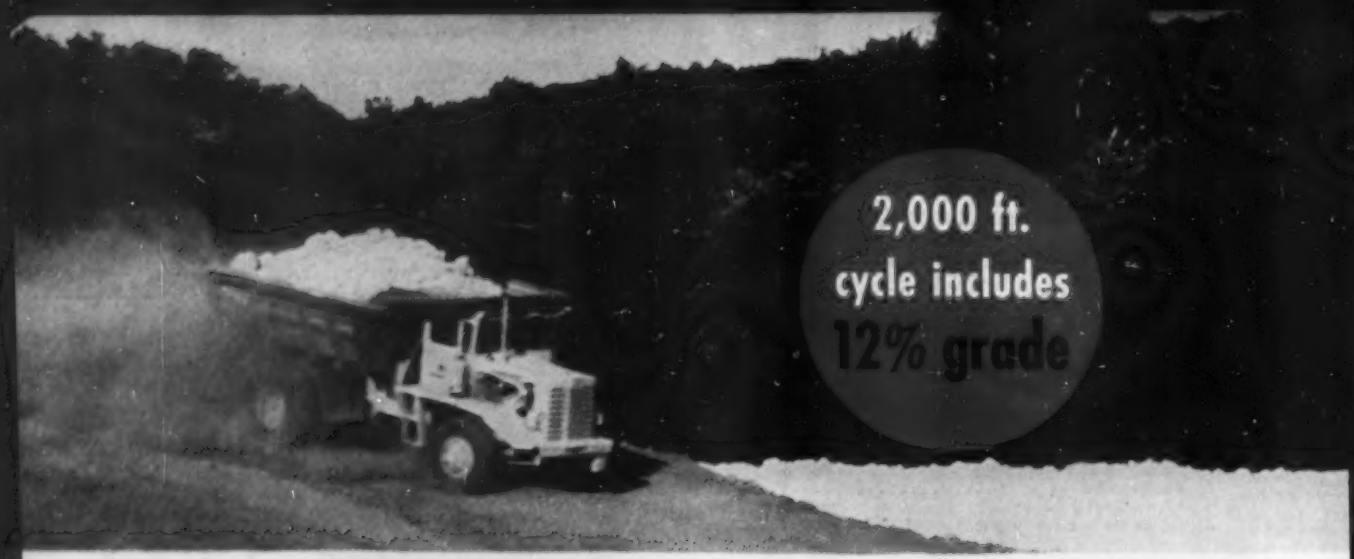
PUBLISHED BY American Trade Journals, Inc.
Wm. B. Freeman, President L. K. Smith, Vice President
Miller Freeman, Jr., Sec.-Treas.

STAFF CORRESPONDENTS: Africa—Johannesburg, Union of South Africa; Salisbury, Southern Rhodesia. Asia—Ankara, Turkey, Kuala Lumpur, Federated Malay States; Tavoy, Burma; Karachi, Pakistan; Seoul, Republic of Korea; Tokyo, Japan. Europe—London, England; Vienna, Austria; Stockholm, Sweden; Trondheim, Norway; Paris, France; Redruth, Cornwall. North and Central America—Mexico D. F., Mexico; Vancouver, British Columbia. South America—Sao Paulo, Brazil; La Paz, Bolivia; Lima, Peru; Bernal, Argentina. Oceania—Port Kembla, N. S. W., Australia; Manila, Phillippine Islands. Not responsible for unsolicited manuscripts.

Mining World Subscription Rates
U. S. North, South and Central America $3.00
Other Countries $4.00
Single Copies ..... $ .50
Directory Number $1.00

WORLD MINING is published the 26th of each month as a regular department of MINING WORLD and is also circulated as a separate publication on a carefully controlled free basis to a selected list of management and supervisory personnel associated with active mining enterprises throughout the world.

MINING WORLD, December, 1956. Volume 18, No. 13. Published monthly, except April, when publication is semi-monthly at Emmett St., Bristol, Conn., Executive, advertising and editorial offices, 121 Second St., San Francisco 5, California. Subscription in United States, North, Central, and South America, $3.00 per year; other countries, $4.00 per year. Entered as second class matter Oct. 10, 1951 at the Post Office at Bristol, Conn., under the act of March 3, 1879. Postmaster: please send notice 3579 to MINING WORLD, 121 Second St., San Francisco 5, Calif.



TWO LOAD-SPEEDING

NO FOOT-BRAKING DOWN-GRADE! Heap-loaded "95" rolls safely down to the fill at 10 mph. Hand-operated Torqmatic brake is standard equipment, gives accurate control at any speed...on any grade.

International® "95" Payhaulers®

average 2400 cu. yds. of rock daily!

High speed (up to 38 mph), 16 cu. yd. capacity, and next-to-automatic operating control of two new International "95" Payhaulers are getting Clarkson Construction Co. record-breaking rock production of 2400 cu. yd. per 10-hour day. Payhaulers are producing this outstanding yardage on the company's 1000-foot cut through dolomite limestone—part of their 7.5 mile, 2-lane highway contract between Bonne Terre and Halifax, Mo.

The Payhaulers are operating on a 2000-foot cycle which includes a 12% grade. On this grade, too tricky and treacherous for Clarkson's other rock haulers, Payhaulers maneuver speedily and safely downgrade —under positive Torqmatic braking control! Payhaulers' high speed of up to 38 mph also permits the fast average round-trip travel time of only 2 min., 45 sec. That's faster than the 3 cu. yd. shovel can load one!

H. D. Brown, project superintendent, says, "The Payhaulers have got all other rock trucks beat. Control we've had with Payhaulers on this job is something we didn't have on any other truck. We've averaged 150 to 162 loads of 16 to 18 cu. yd. per 10-hour day. It's the best production I've ever had!"

Other veteran rock men who have used or seen the International "95" Payhauler in action say the same thing. You'll join them, too! Ask your nearby International Construction Equipment Distributor to give you a demonstration.

"Best Production I've ever had,"

Says H. D. BROWN - Project Superintendent, Clarkson Construction Co., Kansas City, Mo.

BODY UP...DOWN...IN ONLY 12 SECONDS! 3-stage hydraulic hoist gives full-time control. Snubbing assures smooth dumping, gentles body return.

TWO-TON CHUNKS OF LIMESTONE bang into the Payhauler. High-tensile steel sides, triple-section bottom, super-duty "spring cushions," plus strongest frame in "95's" class take rock-shock!

A COMPLETE POWER PACKAGE INCLUDING: Crawler, Wheel, and Pipe-Boom Tractors... Self-Propelled Scrapers and Bottom-Dumps... Crawler and Rubber-Tired Loaders... Off-Highway Trucks... Diesel and Carbureted Engines... Motor Trucks

INTERNATIONAL® CONSTRUCTION EQUIPMENT

International Harvester Company
180 North Michigan Avenue, Chicago 1, Illinois

Drifts and Crosscuts

The Election and the Metal Miner

There is no reason to expect any great changes in the Administration's thinking and planning for the mining industry as a result of the national elections. The United States will continue to have a coalition government—Republican executive department and Democratic legislative branch. Again the balance of Senatorial power will probably be in the hands of the southern Democrats who have worked effectively in previous sessions with western Senators from the raw materials producing states.

With the possible exception of the State Department, no cabinet changes are foreseen. A new Secretary of State, if appointed, would probably be Herbert Hoover, Jr., certainly exceedingly well versed in the minerals field and cognizant of the imperativeness of building a strong domestic mining industry. Secretary of the Interior Seaton has repeatedly pledged that his department will recommend a "Domestic Minerals Policy" to the new Congress. His work is cut out for him in evolving a workable program. However, Russia's recent actions make it all too clear that the Friendly Front of the Geneva Conference is less than "prospect hole deep." Therefore, the Domestic Minerals Policy program should not be lulled into complacency.

In light of the vulnerability of sea lanes so dramatically proven at Suez, some observers believe that greater emphasis must be placed on mineral development in the United States and that South America will become increasingly important as a foreign source. Certainly the wisdom, and administration and congressional support, of the several stock piling laws will be continued.

Depletion should be safe from any tax change. A possibility exists for broadening the exploration cost for income tax purposes. Under the present Treasury Department, there will be no increase in the price for gold.

There should be no major changes in the United States Atomic Energy Commission's ore and concentrate procurement programs nor in the Defence Minerals Exploration Administration and its programs. The latter's program should be expanded to go one step further after a discovery has been made.

Congressional Committee Chairmen will apparently remain about the same with Congressman Carl Durham of North Carolina heading the Joint Committee on Atomic Energy. Senator Murray of Montana should retain his chairmanship of the important Senator Interior Committee, and Congressman Clair Engle of California of the equally important House Interior Committee. The new dean of the Senate will be Senator Hayden of Arizona—a good and long-time supporter of the mining industry and a most important man in the new Congress.

Mining World's 1956 Index In This Issue

The 1956 Mining World Index starts on page 97 in the back of this issue. It is the complete Editorial Index of material published both in the regular January to December issues and in the Mid-April Yearbook.

The Index is a regular December service. It is carefully designed to be of maximum use to every reader. By means of the index, it is possible to find quickly desired information in any of the 13 magazines published this year.

If you don't remember the exact title of the article where you read about plastic piping for uranium mills, there are several ways in which you can find the article. The quickest way is to check the articles under "Uranium" in the Commodity Index. If you didn't know it was a uranium mill, you might have remembered where the mill was located so you could check the Locality Index. It is simple to find the article if you know the company name or the exact article title, as they are both indexed separately. Another possibility if you didn't remember anything but the author's name is for you to check under the author's listing for exact title.

The news columns of Mining World carry hundreds of reports each month on what specific companies are doing in the United States and abroad. These reports have been of great value to the mining industry. As a further service to both industry and readers, a completely separate alphabetical listing of all companies reported on in the news pages is carried. This is another service provided only by Mining World.

Keep this copy on your desk where you can reach it in a hurry. The Index will save you much time in getting the most from every issue.

Mining World Moves To New Office

Mining World has a new and larger office in San Francisco to better serve all its readers. Please see the announcement on page 82 giving full details. Note the new address for all correspondence and also the new telephone number.

Mine haul roads built faster with a D9

Working at an elevation of 6500 feet, the CAT* D9 Tractor pictured here is ripping a mile-long haul road out of a mountainside at Conda, Idaho. The road will be used by Anaconda Mining Co. to bring phosphate ore out of a new open pit mine. Morrison-Knudsen Co., Inc., is the contractor.

With its No. 9S Bulldozer, the big tractor handles blade loads of a dozen cubic yards or more at a time. On this job, the biggest yellow machine is bulldozing a mixture of clay and loose rock to build the 30-foot-wide road. Operators are enthusiastic about the D9's power and ease of operation.

This giant machine is more than a pioneering tool. It has many uses in any open pit mining operation, such as stripping and 'dozing ore to the shovel. The new Turbocharged D9 now gives you even greater horsepower. Its flywheel horsepower has been increased from 286 to 320! *You can give it jobs to do that no other tractor has ever tackled before.*

To match your needs, your Caterpillar Dealer can supply the new D9 with either torque converter or direct drive with exclusive oil clutch. And his reliable parts and service are always at your call. Let him show you what the D9 can do *on the job.*

Caterpillar Tractor Co., San Francisco, Cal.; Peoria, Ill., U.S.A.

CATERPILLAR*

*Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

NAME THE DATE... YOUR DEALER WILL DEMONSTRATE

Capitol Concentrates

New Congress Must Appropriate Funds For Mineral Purchases Under Law 733

Now that all the new strategic mineral purchase regulations have been issued by the General Services Administration there is nothing to worry about, except money matters. The problem is whether or not the available funds will last until the next appropriations period, when a further $70,000,000 must be granted by the Congress to round out the $91,000,000 estimated to be necessary to carry out the programs authorized by Public Law 733. The programs extended by the Office of Defense Mobilization, of course, are covered by Defense Production Act funds already allocated.

News filters into Washington that some producers are stepping up production to a point where the $21,000,000 already appropriated for Public Law 733 may not last until the first regular appropriations bill can be passed. Their action does not seem to be a very smart move.

GSA Changes Name Of Procurement Agency

Trying to keep up with the alphabetical agencies during the war and during the period of later Administration reshuffling of them was quite a chore, but for some time the public had not been taxed with the necessity for remembering a new one. However, that is changed. Those who knew and dealt with GSA's EPS for so many years may now forget it, as the agency has had its blood drained out, washed, and put back again under the symbol of DMS—the Defense Materials Service. What real purpose the change of name serves is a mystery, but there it is!

Incidentally, in the course of making the announcement of the change, GSA Administrator Floete stated, perhaps somewhat rashly, "The stockpile today is a reserve of defense materials, valued at $6,500,000,000, ready for use in a national emergency."

Idaho Forest Order May Set Pattern

The Bureau of Land Management has closed to mineral locations 182 acres of land in the Nez Percés National Forest in Idaho, so that the ground may be used for a recreational area. The announcement stated, however, that mineral land in the area still can be leased. It would seem as though, by this procedure, large areas of our National Forests could be placed under leasing control.

GSA Limits Purchases To Available Funds

The General Services Administration, when announcing the regulations on strategic acid-grade fluorspar and asbestos purchases, stated: "Although both time and quantity objectives have been established for both programs, contracts will be made initially only for such quantities as can be purchased with available funds." This statement evidently refers to some pro-rata proportion of the $21,000,000 appropriation made before the Congress adjourned. One wonders how the split up of funds was determined, especially as acid-grade fluorspar is a new program. GSA continued by saying, "As additional appropriations become available, further contracts will be negotiated."

Farm Agency Barters For Lead and Zinc

Lead and zinc worth $28,000,000 will go into the United States stockpile as a result of August barter deals with foreign countries. The Agriculture Department reports it contracted during the month to trade government-owned farm commodities for $26,900,000 worth of zinc and $1,100,000 worth of lead. While no tonnages were given, current market prices indicate this would mean about 3,400 tons of lead and 99,600 tons of zinc.

These contracts do not call for specific farm commodities to be supplied by the United States. Instead, foreign nations, dealing through United States contractors, may take their choice of United States surplus commodities offered for sale at the time the transaction is made. The law provides such contracts may be made only with friendly foreign nations, and the department normally does not disclose the nations with which it deals.

What's Ahead For Zinc?

Government purchases of zinc for the national stockpile at the end of September totaled approximately 285,000 tons, according to figures compiled by the American Zinc Institute. The original goal for government purchases, under the accelerated stockpiling program started in 1954, was said to have been 300,000 tons. This total, if not reached in October, certainly will be attained and probably exceeded in November.

Deliveries to the government during the first nine months of 1956 totaled 89,486 tons, compared with 87,200 tons in all of 1955. September deliveries were 18,301 tons, the highest since January of 1955, and 2,226 tons more than in August.

With 1956 zinc production up and consumption down from the 1955 levels, the price future for zinc is vulnerable and will be profoundly affected by the government's policy on stockpiling. The producers are anxiously awaiting an answer.

ODM Reports On Stockpile Purchases

The Office of Defense Mobilization, in its semi-annual report to Congress, announced that stockpile objectives were reached for mercury, iridium, platinum, and battery-grade manganese in the six-month period ended June 30, 1956. As a result, minimum objectives have been attained on 44 materials, and long-range objectives on 11 items, out of the 74 materials marked for stockpiling.

Strategic materials purchased during the first six months of the year amounted to more than 600,000 tons and cost $145,000,000. Cost of goods bought for the minimum stockpile was given as $93,500,000 and for the long-term stockpile as $51,500,000.

The ODM report noted that barter of surplus agricultural commodities for strategic materials currently represents the largest single source of strategic materials. Barter agreements in the six-month period, negotiated by the Commodity Credit Corporation, covered $191,000,000 worth of materials for the strategic stockpile and $55,000,000 for the supplemental stockpile. Total acquisitions acquired through barter were said to have a value of $162,000,000, with an additional $330,000,000 on order.

Since 1946, the government has accumulated $6,000,000,000 worth of critical and strategic materials weighing 24,000,000 tons and stored in 242 locations.

Suez Difficulty Affects Metal Prices

The Suez Canal and Israeli situation points up graphically the need for domestic sufficiency in strategic minerals. It also indicates the need for a wider domestic mobilization base than the Joint Chiefs of Staff and the Office of Defense Mobilization have established. Tin in London had moved to $1.14 per pound in early November, and manganese ores, 44 percent and over, have risen to $1.55 including the export tax our good Indian friends now are imposing.

Minnesota Company Processes Low-Grade Manganese

The General Services Administration has maintained there is no satisfactory method of processing low-grade manganese ores, in spite of testimony before the Senate Interior Committee to the effect that at least two processes are economically satisfactory. Now comes the report that the Manganese Chemicals Corporation in Minnesota is successfully making at a profit synthetic battery-grade manganese from the 7.0 to 8.0 percent Cuyuna Range manganese ores and has already turned out over $1,000,000 worth of specification-grade product. It seems a little silly to maintain that the ores in the GSA stockpiles, which run around 20 percent, cannot be treated without spending more millions for experimental work.

COMING CONVENTIONS

December 3, 1956. Annual meeting AMERICAN MINING CONGRESS, Terrace Room, Hotel Plaza, New York, New York.

February 7, 8, and 9, 1957. National Western Mineral Conference and 60th Annual Convention of the COLORADO MINING ASSOCIATION. Shirley Savoy Hotel and Mile High Center, Denver, Colorado.

March 3rd through 9th, 1957. Joint meeting AMERICAN SOCIETY OF PHOTOGRAMMETRY and AMERICAN CONGRESS ON SURVEYING AND MAPPING, Shoreham Hotel, Washington, D. C.

April 5, and 6, 1957. PACIFIC SOUTHWEST MINERAL INDUSTRY CONFERENCE, sponsored by the Nevada, San Francisco, and Southern California sections of the AIME. Reno, Nevada.

How a new **CAT*** No. 12 can

STEP UP YOUR MINE'S EFFICIENCY 3 WAYS

This new Caterpillar No. 12 Motor Grader maintains 16 miles of haul road and 'dozes truck spillage at the Hill-Trumbull Mine, Marble, Minn. It is owned by the Mesaba-Cliffs Iron Company and operated by the Cleveland-Cliffs Mining Company of Cleveland, Ohio. In building and maintaining haul roads for faster cycle times and reduced wear and tear on equipment, in 'dozing and clean-up work, the new Caterpillar No. 12 does a big and important job. Here is how it can do it at lower cost in *your* mine:

1. LOWER OPERATING COST. The new No. 12 delivers its 115 HP on non-premium, low-cost fuels. Its new oil clutch gives you longer clutch life, easier operation, and as much as 1500 hours between clutch adjustments. Tubeless tires (furnished at no extra cost) run cooler, last longer, and eliminate the tube and flap down time of old-fashioned tires.

2. LONGER WORK LIFE. Like all Caterpillar Motor Graders, the No. 12 is built—not just assembled—by a single manufacturer. This means traditionally sound Caterpillar ruggedness and workmanship, and careful balancing of engine and blade capacity for long life and high efficiency. And it means a single source for parts and service—your reliable Caterpillar Dealer.

3. INCREASED PRODUCTION. Positive, non-creep controls, easy "feel-of-the-road" steering, sure-footed traction with engine positioned over the driving wheels, quick-change blade positioning, unobstructed visibility—all these are good reasons why operators *like* the Caterpillar No. 12 Motor Grader, and do more efficient work on any job.

Your Caterpillar Dealer will demonstrate these and other features of the fast-working, long-lasting No. 12 Motor Grader. See him for proof that the Cat No. 12 will do more work at less cost on *your* job than any other grader.

Caterpillar Tractor Co., San Francisco, Calif.; Peoria, Ill., U.S.A.

CATERPILLAR*

*Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

99% OF ALL CAT MOTOR GRADERS EVER BUILT ARE STILL AT WORK

Those Who Use Them . . . Choose Them Again

BUCYRUS ERIE ROTARY BLAST HOLE DRILLS

In December, 1952, the Maumee Collieries Co., Terre Haute, Indiana, put the first Bucyrus-Erie 50-R into operation. So outstanding were the footage records of this drill that the company has since added three more.

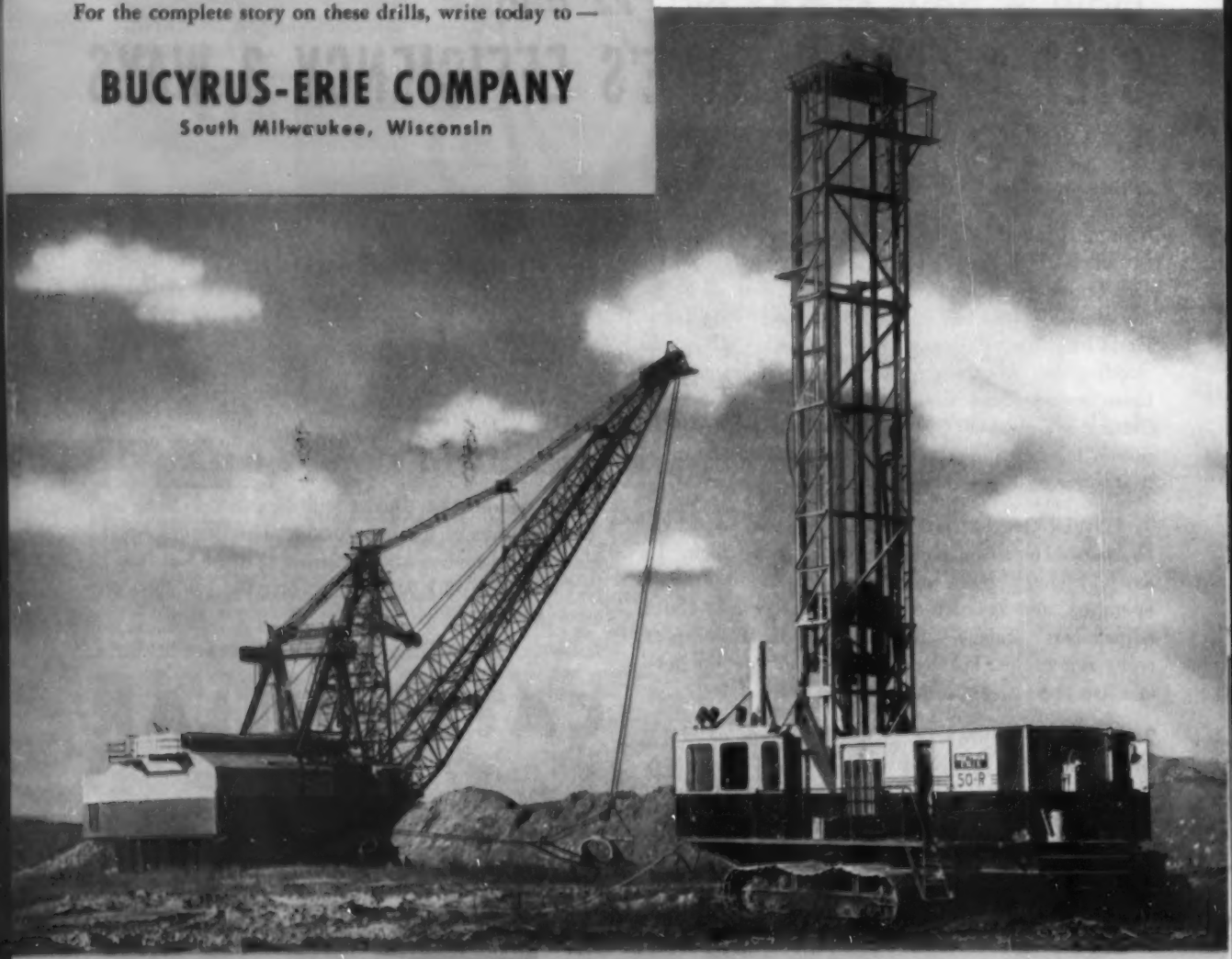
All over the country the story is the same — those who buy one Bucyrus-Erie rotary soon want to convert completely to these moneymakers. Here are just a few of the many reasons why:

- Hydraulically-powered down pressure on the bit provides maximum controlled penetration.
- Ward Leonard electric control on rotation of the drill stem permits drilling at the most efficient speed for a given formation.
- Hole can be drilled continuously for the full length of a drill pipe. (32 ft. 9 in. for the 50-R; 27 ft. 9 in. for the 40-R)
- A remote-controlled, power-driven drill pipe rack adds or removes drill pipe without manual effort. Rack also stores pipe not in use.

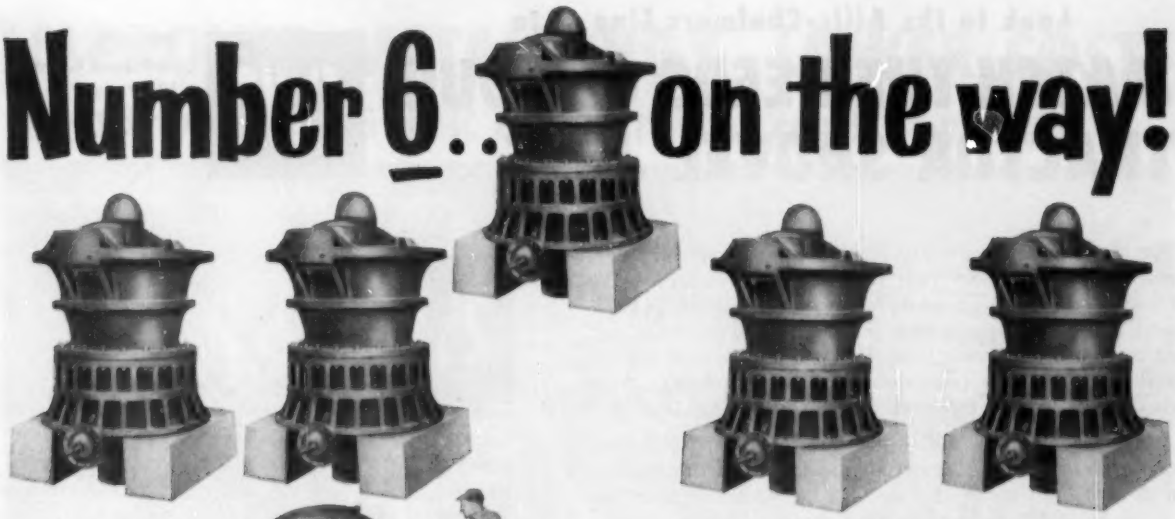
36856C

BUCYRUS-ERIE rotaries are available in two sizes — the 40-R (equipped with either diesel-electric or full electric power) for drilling 6¾- to 9-in. holes, and the 50-R (electric only) for drilling 9⅞- to 12¼-in. holes. For the complete story on these drills, write today to —

BUCYRUS-ERIE COMPANY
South Milwaukee, Wisconsin



Number 6... on the way!



Another Traylor TC Gyratory is added to the 5 on order for Big Taconite Project

Profitable production of iron ore from low-grade Taconite calls for the most modern, efficient methods and equipment. That's why Traylor Gyratories were the choice for both primary *and* secondary reduction at one of the extremely hard Taconite-bearing ore properties.

The initial order included a Gyratory Crusher with 60" receiving opening and 102" diameter crushing head, this huge TC Primary Crusher takes chunks of ore the size of a flat-top desk and reduces them to 12" at the rate of 4,000 long tons an hour. Four Traylor 36" Gyratories were included on the original order . . . to take the 12" ore and reduce it to minus 5" in the secondary crushing operation. Now . . . we've received an order for another 36" Gyratory to join the five now being built.

For complete specifications and description of the outstanding features of Traylor TC Gyratory Crushers, send for your copy of Traylor Bulletin #126.

TRAYLOR ENGINEERING & MFG. CO.
857 MILL ST., ALLENTOWN, PA.
SALES OFFICES: New York · Chicago · San Francisco
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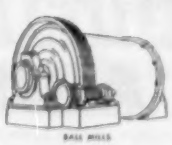
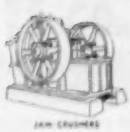
Traylor


PRIMARY GYRATORY CRUSHERS


ROTARY KILNS

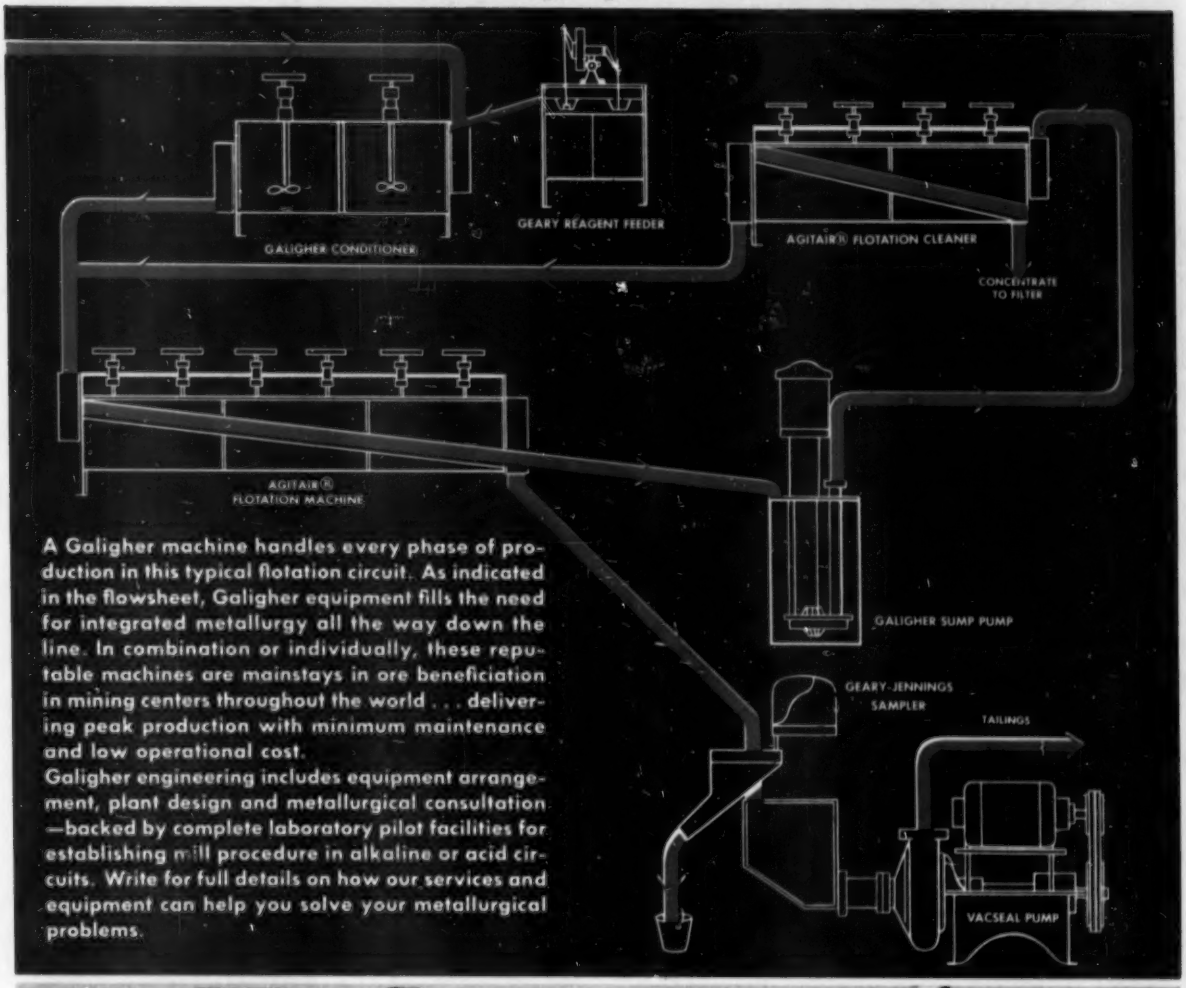

SECONDARY GYRATORY CRUSHERS


BALL MILLS


JAW CRUSHERS


APRON FEEDERS

IMPROVED METALLURGY - LOWER COSTS
with GALIGHER Equipment and Services



A Galigher machine handles every phase of production in this typical flotation circuit. As indicated in the flowsheet, Galigher equipment fills the need for integrated metallurgy all the way down the line. In combination or individually, these reputable machines are mainstays in ore beneficiation in mining centers throughout the world . . . delivering peak production with minimum maintenance and low operational cost.

Galigher engineering includes equipment arrangement, plant design and metallurgical consultation—backed by complete laboratory pilot facilities for establishing mill procedure in alkaline or acid circuits. Write for full details on how our services and equipment can help you solve your metallurgical problems.

AGITAIR® FLOTATION MACHINE | VACSEAL PUMP | GEARY-JENNINGS SAMPLER | GALIGHER SUMP PUMP | GEARY REAGENT FEEDER

Leaders in Experience and Service

HOME OFFICE: 545-585 W. 8th South
P. O. Box 209
Salt Lake City 10, Utah
EASTERN OFFICE: 921 Bergen Ave.
(Room 721)
Jersey City 6, New Jersey

THE GALIGHER CO.

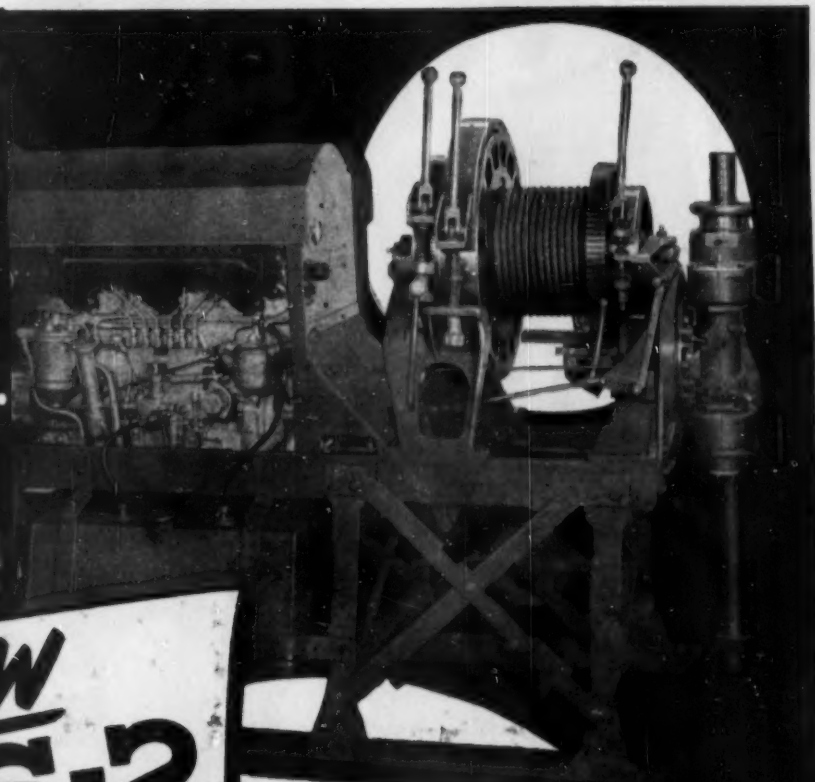
METALLURGICAL DIVISION · THE GALIGHER COMPANY · ENGINEERING SERVICE

AP 507

CONSULTATION • ORE TESTING • PLANT DESIGN

GALIGHER PRODUCTS: AGITAIR® Flotation Machine, VACSEAL Pump, Geary-Jennings Sampler, Acid-proof Sump Pump, Geary Reagent Feeder, GAL-CLONES, Laboratory AGITAIR® Flotation Machine, Laboratory Pressure Filter, Laboratory Ball Mill, Rubber Lined and Covered Products, Plastic Fabrication.

DOWN to 3500 ft. with the NEW BBS-2 HOIST



NEW BBS-2SR HOIST BOOSTS CAPACITY TO GREATER DEPTHS

This is a "Special Duty" hoist to increase the capacity of the BBS-2 Drill where a travelling block can be used. This combination will enable the drill to handle 3,500 ft. of 'A' rods.

It features a 22" dia x 3" wide brake drum mounted directly on the hoist drum. The self-energizing brake on this drum utilizes ¾" thick heavy duty "block type" brake lining.

The original planetary brake remains unchanged, thus one brake may be used to relieve the other under severe conditions.

The hoist drum itself is 30% wider than the standard heavy duty hoist drum. It will spool 95 ft. of ⅝" cable or 65 ft. of ¾" cable.

The ¾" cable is used for single line hoisting, while the extra capacity for ⅝" cable makes this hoist ideal for double line work.

KITS FOR CONVERSION FROM STANDARD BBS-2 HOISTS AVAILABLE NOW

BOYLES BROS
DRILLING COMPANY LTD
VANCOUVER, CANADA

Boyles Bros. (Pty) Ltd., Johannesburg, South Africa • Boyles Bros. Drilling Co. Ltd., Newcastle-on-Tyne, England • Atlantic, Gulf and Pacific Co. of Manila, Philippines
Shriro Trading Co., S.A., Tokyo, Japan • Formac S.A., Rio De Janeiro, Brazil • Weise and CA., Lda., Lisbon, Portugal
Cia. Diamantina B-H S.A., Lima, Peru • R.I.E.G.A., Buenos Aires, Argentina • Hoehre and Co. A/S. Oslo, Norway • International Machinery Co., Santiago, Chile
Dimitry Scalistiri, Athens, Greece • Thomas M. Nevin Y. Cie. S.A. Mexico, D.F. • Boyles Bros. (Pty) Ltd., Kitwe, Northern Rhodesia
Trilliance Engineering Co., New Delhi, India

"IN CASE OF EMERGENCY"

Mine emergencies happen without warning . . . and when they do happen, equipment that carries the "in case of emergency" label suddenly becomes vital to fire fighting and rescue efforts. Breathing protection devices are a major part of emergency mine equipment.

Below is a check list of this equipment offered by MSA. If you would like to make sure your emergency program is up-to-date, why not have our representative check your requirements and suggest a regular inspection and maintenance schedule.

M-S-A McCAA® Oxygen Breathing Apparatus—
gives complete breathing protection in any unbreathable atmosphere for a minimum of two hours. Used under the hardest physical conditions . . . in fighting and sealing fires, re-establishing ventilation, and rescue operations. U. S. Bureau of Mines approved.

M-S-A Chemox®—
allows complete breathing protection in any gaseous or oxygen deficient area for a minimum of 45 minutes. Generates its own oxygen supply from replaceable canister. Weighs only 13½ lbs. U. S. Bureau of Mines approved.

M-S-A All-Service Mask®—
assures safe, comfortable breathing protection against smoke and toxic gases including carbon monoxide—singly—or in combination where there is sufficient oxygen to sustain life. U. S. Bureau of Mines approved.

M-S-A Self-Rescuer®—
a miniature mask for use in deadly carbon monoxide following fire or explosion. Gives the miner precious minutes of emergency breathing protection. Unit is compact, lightweight; may be stored in quantity underground or carried individually. U. S. Bureau of Mines approved.

M-S-A Air and O_2 Mask—
designed for 30 minutes maximum breathing protection in any atmosphere—supplies air or oxygen in exact accordance with breathing requirements. Flow ceases during exhalation for added economy. Comfortable to wear and easy to use.

M-S-A Pneolator®—
provides automatic artificial respiration that assures maximum chances of recovery for victims of poisonous gases, electrical shock, heart attacks, or other causes of asphyxia. Housed in compact, lightweight glass fiber case.

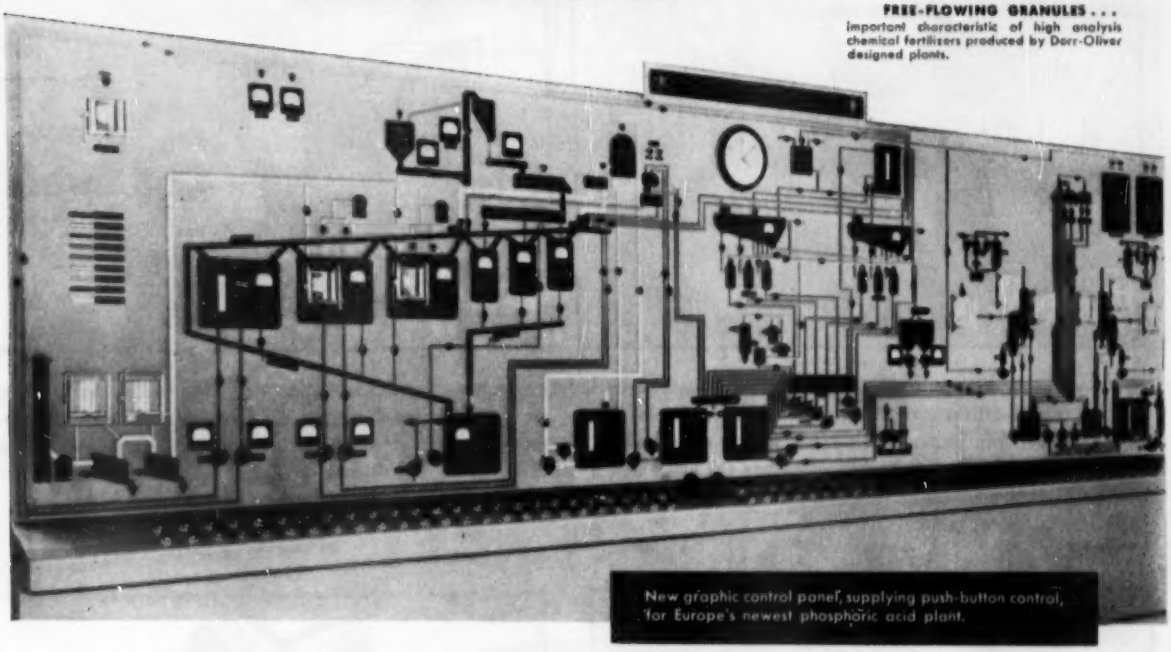
SAFETY EQUIPMENT HEADQUARTERS

MINE SAFETY APPLIANCES COMPANY
201 North Braddock Avenue, Pittsburgh 8, Pa.
At Your Service: 77 Branch Offices in the United States and Mexico

MINE SAFETY APPLIANCES CO. OF CANADA, LTD.
Toronto, Montreal, Calgary, Edmonton, Winnipeg, Vancouver, Sydney, N.S.

Nerve Center of Europe's Newest Phosphoric Acid Plant

FREE-FLOWING GRANULES . . . important characteristic of high analysis chemical fertilizers produced by Dorr-Oliver designed plants.



New graphic control panel, supplying push-button control, for Europe's newest phosphoric acid plant.

designed – engineered – equipped by Dorr-Oliver

Europe's newest phosphoric acid producer selected Dorr-Oliver as designers and engineers for their new project. This new, fully automatic plant, one of the largest in the European fertilizer field, is being constructed with the assistance of the combined world-wide facilities of the Dorr-Oliver organization. The plant was designed by D-O's Consulting Engineering Dept., Stamford, Conn.; and by taking advantage of favorable world-wide prices, the necessary plant equipment was supplied from D-O Associate Companies in London, Milan, and Amsterdam.

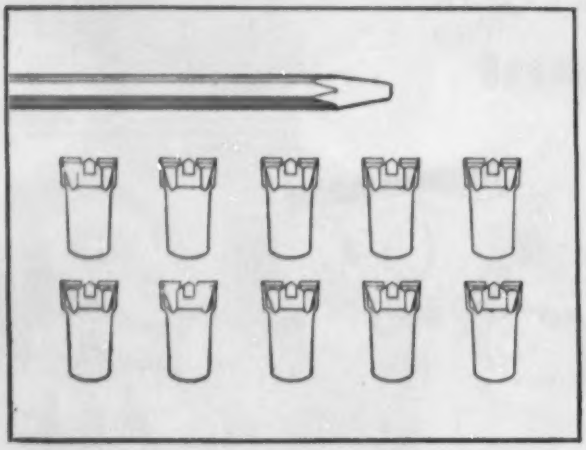
Dorr-Oliver's Consulting Engineering Department, with 40 years' experience in the field of concentrated fertilizer production via the wet process of manufacturing phosphoric acid, is staffed by engineers fully qualified to handle all phases of fertilizer plant design — from economic analysis to supervision of initial operation.

If you are considering entering the fast growing fertilizer field — or if you plan to expand present plant facilities — it will pay to check with Dorr-Oliver. Write for Bulletin #8000, or better still, let us send an engineer to discuss your problem from the standpoint of economics and process. No obligation, of course.

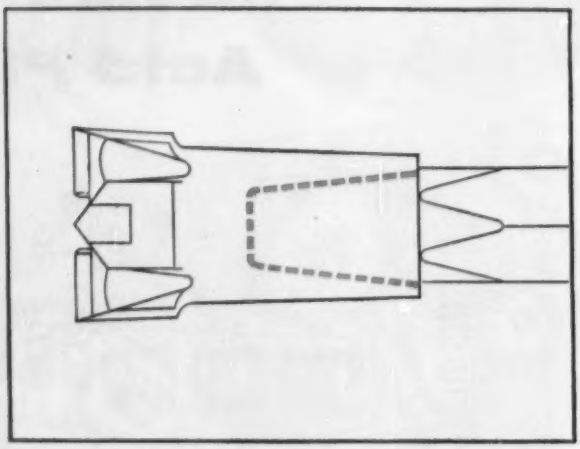
DORR-OLIVER
INCORPORATED
WORLD-WIDE RESEARCH • ENGINEERING • EQUIPMENT
STAMFORD • CONNECTICUT • U.S.A.

New Timken® tapered

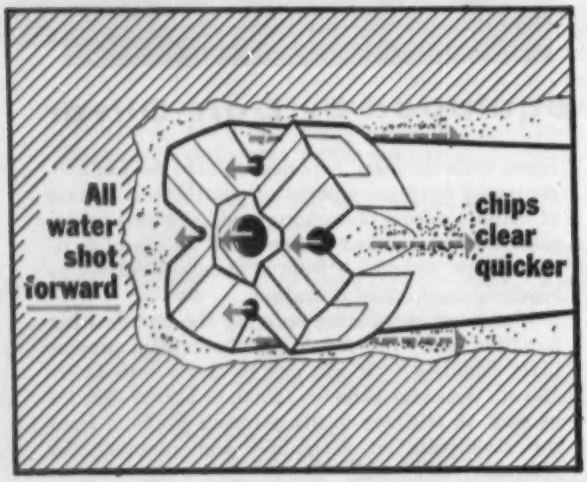
It's removable, remains secure, speeds chip



1 CHANGE BITS—SAVE STEEL, Simply remove the old bit, put the new one on the same drill steel. You don't have to lug heavy steels back to the shop for re-sharpening. And no need to throw away the steel when the bit is used up. You can drill out the full life of every steel . . . cut steel costs.



2 TAPERED SOCKET STAYS TIGHT. The new Timken® bit has a tapered socket that provides a more secure union than threads for air-leg drills. Its precision-made taper fits tight to the drill steel, reduces breakage, cuts expense. Gives you lowest cost per foot-of-hole.

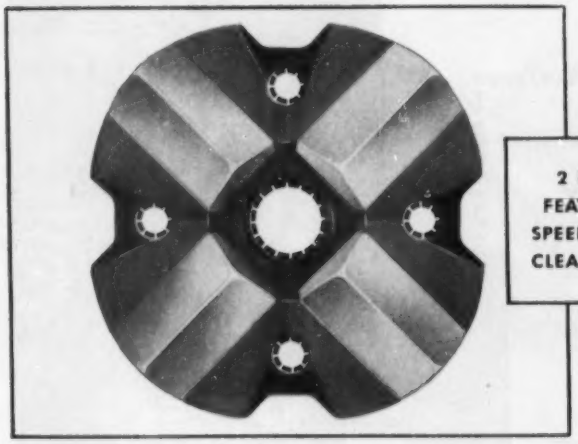


5 HOW CHIPS CLEAR FASTER. Here's how five front holes and the deeper, wider clearance, working together, clear chips faster—speed drilling—lengthen bit life. New, special analysis carbide inserts give cutting face superior wear resistance. Write today for free brochure. The Timken Roller Bearing Company, Canton 6, Ohio. Cable: "TIMROSCO".

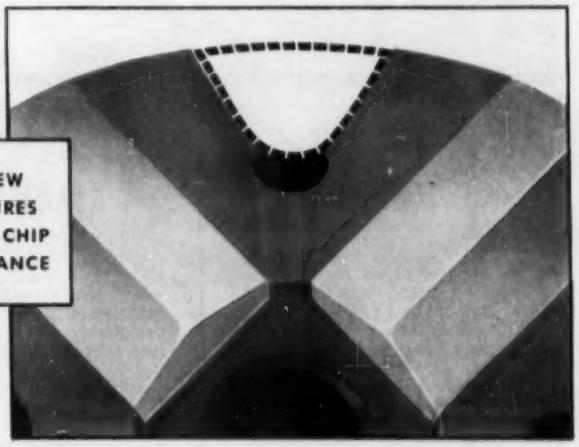
NEW TIMKEN THREADED BIT FOR OTHER TOUGH DRILLING JOBS. These new design features speed chip removal. 1) five front holes; 2) deeper, wider clearance; 3) deeper undercut under the heel. New wear-resistant carbides add life. Improved thread contact reduces breakage. You get lower cost per foot-of-hole.

socket bit FOR AIR-LEG DRILLS AND LIGHT STOPING

removal—gives lower cost per foot-of-hole



2 NEW FEATURES SPEED CHIP CLEARANCE



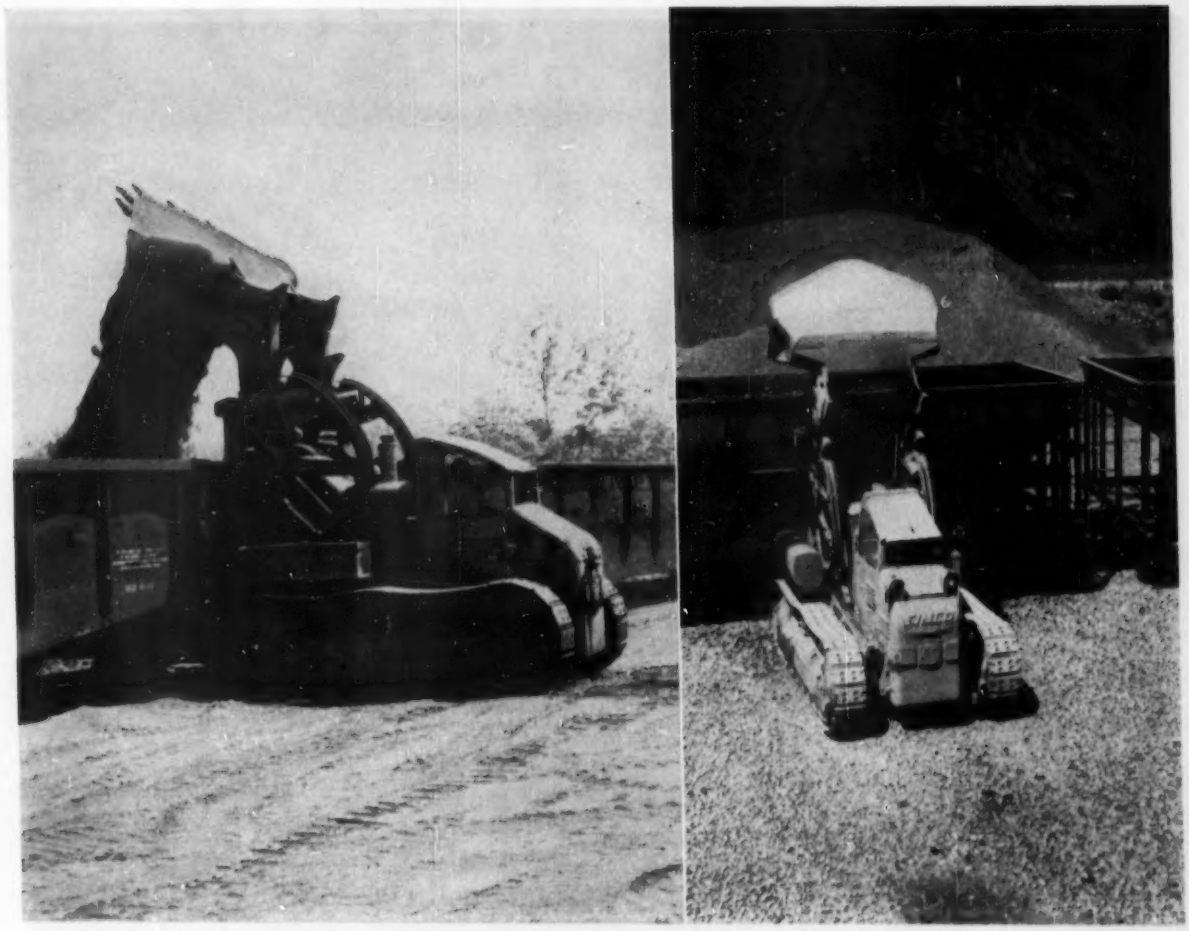
3 FIVE FRONT HOLES. New frontal design has five front holes that shoot the water streams directly in front of the bit—wash away chips faster. Bit spends more time drilling new rock, less time "drilling" chips. Larger center hole, with plug dropped deeper for freer cutting action, means less drag on the bit.

4 DEEPER, WIDER CLEARANCE. Extra deep, wider clearance between cutting wings permits water to carry chips faster from the cutting face of the bit. This faster chip flow speeds drilling and helps increase cutting efficiency. See diagram at left, below.

TIMKEN *REMOVABLE ROCK BITS*

TRADE-MARK REG. U. S. PAT. OFF.

Your best bet for the best bit for every job...threaded carbide insert, multi-use, tapered carbide insert



EIMCO 105 – A LOADING CYCLE TIME SAVER

Working for a major railway firm in track maintenance operations, an Eimco 105 Tractor-Excavator provides extra-production capacity in loading out a 50-cubic-yard car every eight minutes. The Eimco loads 125 cubic yards more every hour than the machine it replaced.

For this steady job, the 105 is equipped with the high discharge rocker arms and bucket.

The Eimco replaced a 1½ yard shovel that was loading five cars an hour. Before the operator mastered extra-production features of the 105, it was loading six cars an hour. With an experienced operator, it now averages 7½ cars an hour.

Previously, one of two dozers pushing gravel toward the loading edge, came off the 50-foot-high pile to push loaded cars to the switch. The 105 now accomplishes this task and the shovel and one dozer have been released to work elsewhere.

How does the 1½ yard Eimco, with an initial investment that is nearly one-third less, take on extra duty and still increase production?

The answer is in the 105's ability to save time during every loading cycle. With one hand, the operator pushes two, easy-to-reach levers and the Eimco moves in for a load. Powerful crowding actions fills the bucket quickly. He pulls the levers and the 105 reverses to the haulage car while the loaded bucket is elevating in an arc.

When the Eimco is in dumping position, the bucket is in discharge position. There's no lost motion between loading and discharge.

Independent track control permits the 105 to maneuver fast and sharp—another time saver.

And shifting between high and low speeds—forward and reverse—is done under maximum loads at anytime without injury to the transmission. You don't have to stop to shift—or hesitate until the tachometer needle falls below the recommended RPM reading.

The best way to get an idea how the Eimco 105 will increase your production is to watch it perform. You can arrange this today by writing Eimco.

THE EIMCO CORPORATION

Salt Lake City, Utah—U.S.A. • Export Offices: Eimco Bldg., 52 South St., New York City

New York, N. Y. Chicago, Ill. San Francisco, Calif. El Paso, Tex. Birmingham, Ala. Duluth, Minn. Kellogg, Ida. Pittsburgh, Pa. Seattle, Wash.
Cleveland, Ohio Houston, Tex. London, England Gateshead, England Paris, France Milan, Italy Johannesburg, South Africa

B-327

Steel arches "give" to make mining safer

The secret of safety in this ore drift lies in the Bethlehem Yieldable Arch sets which "give" instead of deforming under excessive load. The yielding feature is formed by over-lapping two adjoining nestable segments and fastening them together with heavy U-bolt clamps.

The tightness of the clamps controls the sliding action of the arch. Properly adjusted, the joints hold fast under normal loads. But when unusually heavy pressures begin to bear down, the joints yield before deformation of the steel can occur, permitting natural subsidence of the surrounding strata and redistribution of the load. The structural integrity of the arch is maintained and safety underground preserved.

There's real economy in these arches, too! First of all, thanks to their yieldability, they far outlive conventional timber supports and for this reason alone often pay for themselves within a year. And, on top of that, they are usually recoverable for re-installation elsewhere.

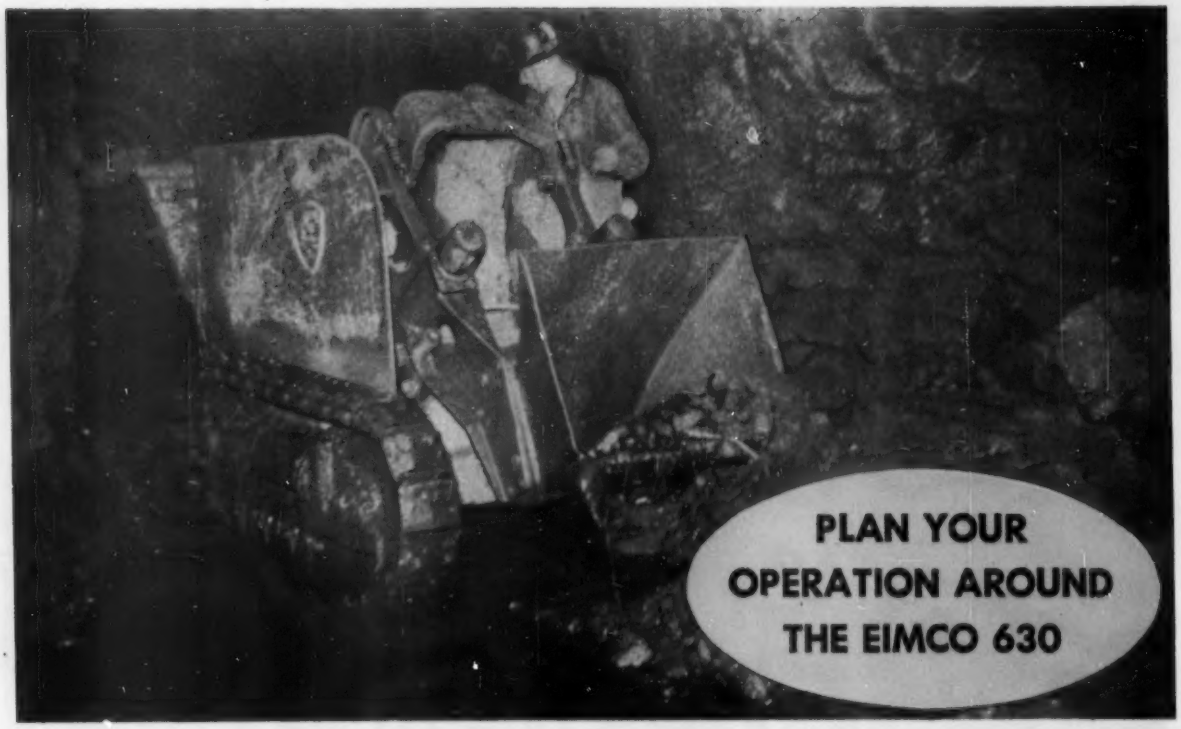
The Yieldable Arch is easy enough to install; no special tools or fancy equipment is needed. Your own men can set them up and take them down with only a minimum of technical supervision. Pictured above is the standard arch; you can also get Yieldable Rings or special shapes and sizes to meet your individual needs. A Bethlehem Pacific engineer will gladly give you full details.

BETHLEHEM PACIFIC COAST STEEL CORPORATION

Sales Offices: Los Angeles, Phoenix, San Francisco Portland, Seattle, Spokane

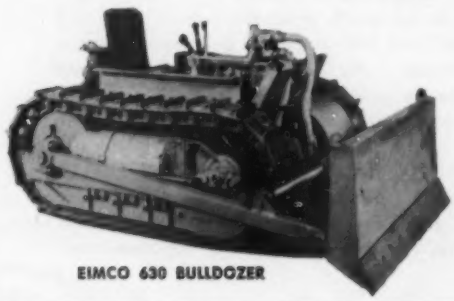
BETHLEHEM PACIFIC

BETHLEHEM STEEL



Under the most adverse conditions, this Eimco 630 Crawler-Excavator is a production giant. But miners are discovering its capacity is even more phenominal where mining methods are adapted to the 630's high-production features.

EIMCO 630 EXCAVATOR



EIMCO 630 BULLDOZER

A veteran European mining official—after watching the Eimco 630 Crawler-Excavator load from drawpoints—plans to adopt excavating-loading methods that permit maximum use of the 630's high-production features.

Like any other member of the industry, he wants equipment that gets the highest production rate at lowest maintenance and operating costs.

The ease with which the 630 handles digging and loading chores in confined quarters, convinced this mine manager of its extra-production, economical operating potential before he studied verifying records. And the crew, shift boss, foreman and superintendent were enthusiastic in their appraisal of the machine.

In this mine, the Eimco loads up to 435 tons during a 6½ hour shift where existing conditions do not permit it to load at full capacity. Maintenance costs are less than five cents a ton.

By adopting methods conducive to full capacity operation, production for the newly proposed mine is conservatively placed at 500 tons a shift. Maintenance and operating costs will be one-third that required by competitive equipment used previously.

The Eimco 630 has independent track control for extra maneuverability; easy-to-work levers for operating efficiency; powerful crowding action that quickly fills the big, half-yard bucket; fast discharge ability that cuts loading cycle time, and dependable, rugged construction.

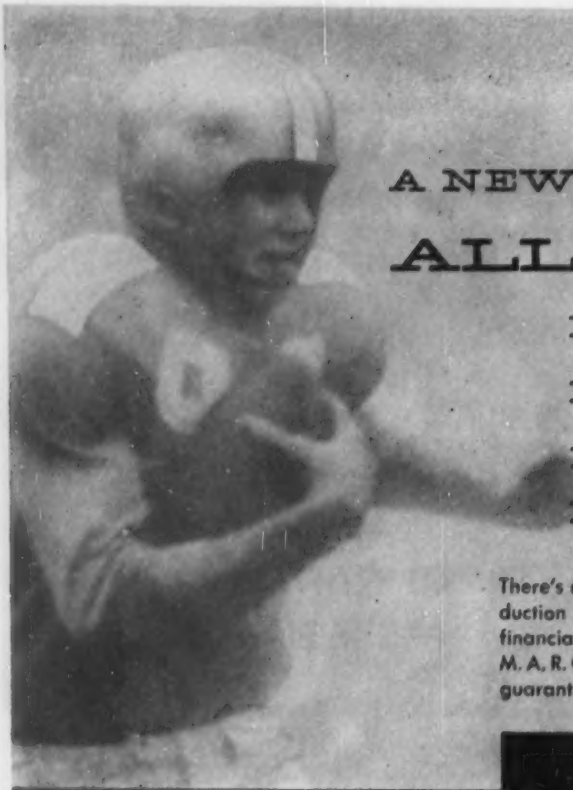
The best way to form an idea how the Eimco 630 will get you more tonnage profit than any other underground mucking machine is to see it in action!

THE EIMCO CORPORATION

Salt Lake City, Utah—U.S.A. • Export Offices: Eimco Bldg., 52 South St., New York City

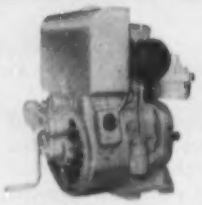
New York, N. Y. Chicago, Ill. San Francisco, Calif. El Paso, Tex. Birmingham, Ala. Duluth, Minn. Kellogg, Ida. Pittsburgh, Pa. Seattle, Wash.
Cleveland, Ohio Houston, Tex. London, England Gateshead, England Paris, France Milan, Italy Johannesburg, South Africa

B-228

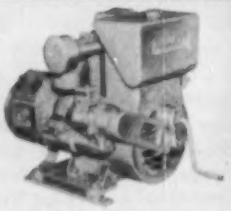


A NEW ALL-AMERICAN LINE-UP OF LOW-COST, LIGHTWEIGHT DIESEL ENGINES

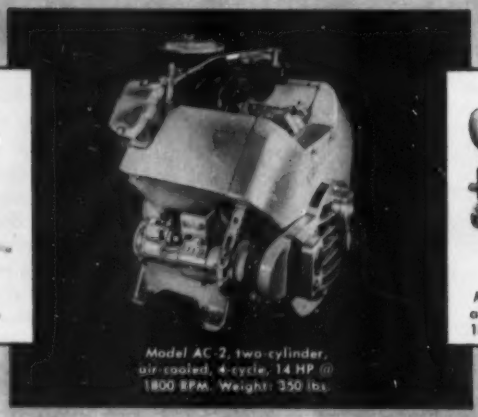
There's a new team now pulling together in the design and production of America's finest line-up of small Diesel engines. The financial strength and manufacturing experience of American M. A. R. C. is now firmly behind the line of Hallett Diesels—a guarantee that they represent greater values than ever before.



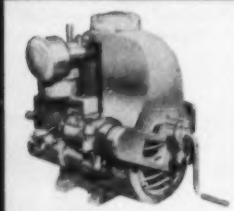
Model WC-1, one-cylinder, water-cooled, 4-cycle, 6 HP @ 1800 RPM. Wt.: 220 lbs.



Model AIQ-3KW, one-cylinder, air-cooled, 4-cycle, 3KW @ 1800 RPM, 6-7 HP



Model AC-2, two-cylinder, air-cooled, 4-cycle, 14 HP @ 1800 RPM. Weight: 350 lbs.



Model AC-1, one-cylinder, air-cooled, 4-cycle, 6 HP @ 1800 RPM. Weight: 220 lbs.

★ **Air or Water Cooled; 5.5 to 25 hp**

★ **All-American, from basic materials to completed engines**

★ **Available as portable power units, generating plants, pumping units, or for marine propulsion**

Mass production of American M. A. R. C. Diesels will be accelerated greatly in a new and larger plant that is now under construction. The latest in automatic processing machinery and streamlined production lines will speed the delivery of present models. Already the leader in the low power, lightweight Diesel engine field, new models to come will further strengthen this position. Some desirable sales territories are open; dealer inquiries are invited.

If you need a reliable, lightweight, full-Diesel for industrial or marine applications—or as a prime mover of powered equipment—write for literature. You'll be surprised and pleased at American M. A. R. C.'s small size, low cost, and modern "All-American" Diesel engines.

*American Manufacturing and Research Company

8-100

ENGINES OF QUALITY

AMERICAN M.A.R.C.* INC.
DIESEL ENGINES

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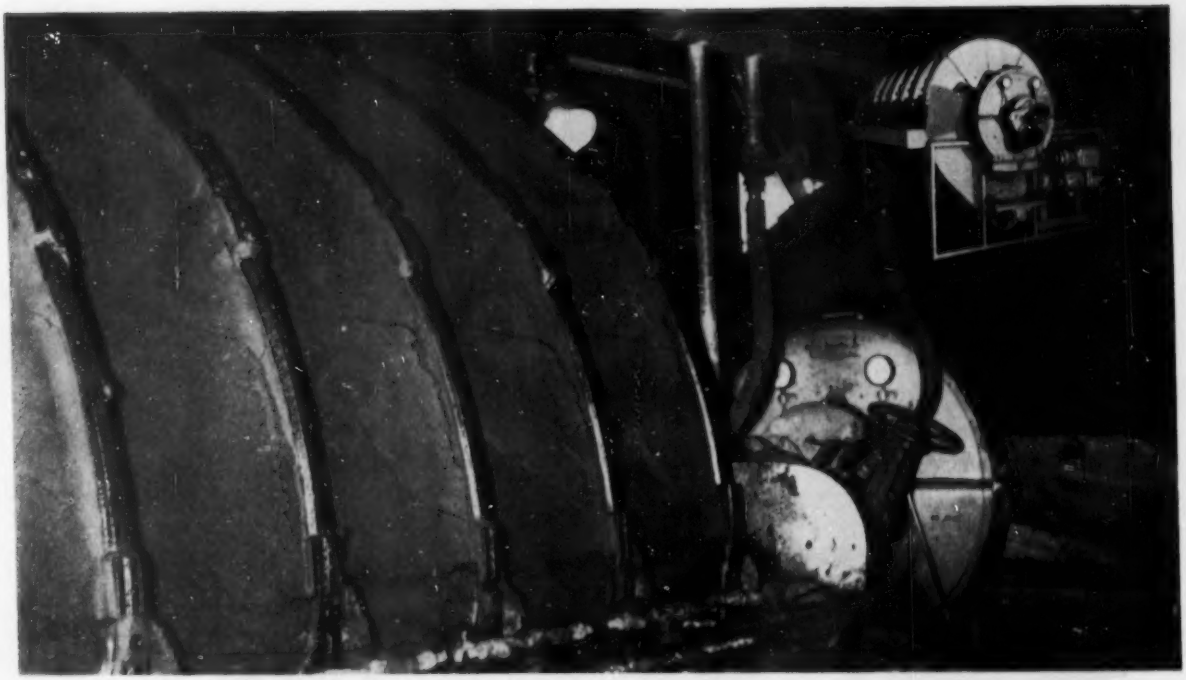


EIMCO AGIDISCS DEWATER SPODUMENE

An Eimco Agidisc Filter is operating in a concentrator processing a spodumene slurry where critical problems are: (1) Heat drying method employed on the filter cake requires low moisture content and (2) solids in the feed are extremely variable and have fast settling characteristics.

The Eimco Agidisc is proving its ability to handle this difficult job by producing uniform cake formations with low moisture content at high production rates.

Its ability to keep fast settling solids in uniform suspension through strong, properly directed agitation exceeds that of any equipment previously used by this firm. The Agidisc tank shows no evidence of silting, and erosion from spodumene particles has not occurred.

The Agidisc shows these advantages over an inside drum-type filter operating in the same plant:

THE EIMCO AGIDISC FILTER		INSIDE DRUM-TYPE FILTER
At production rate 58.2 lbs. wet cake per minute, moisture content is 11.0%. Dry Solids: 51.8 lbs. per sq. ft. per minute.	DRYING CYCLE	**At production rate 58.2 lbs. wet cake per minute, moisture content is 14.3%. Dry Solids: 49.9 lbs. per sq. ft. per minute.**
About 80% effective filter area.	EFFECTIVE AREA	**About 60% effective filter area.**
Initial cost: $(1)X	COST	**Initial cost: $(2)X**
Floor-space requirements: (1)X	FLOOR SPACE	**Floor-space requirements: (2)X**
Simple. Requires minutes.	MEDIUM CHANGE	**Complicated. Requires hours.**

The ultimate success of any filter operation is measured in terms of economic values. Here, the Eimco Agidisc is getting more $ value per square foot of filter area considering (1) initial cost, (2) product excellence and (3) production volume.

Eimco's modern research and development center at Palatine, Ill., has the facilities to help you choose the right "tools" for your filtration job. And there's an Eimco filter that will do the job. Write today!

THE EIMCO CORPORATION
SALT LAKE CITY, UTAH

Research and Development Division, Palatine, Illinois • Process Engineers Inc. Division, San Mateo, California
Export Offices: Eimco Building, 51-52 South Street, New York 5, N. Y.
BRANCHES AND DEALERS IN PRINCIPAL CITIES THROUGHOUT THE WORLD

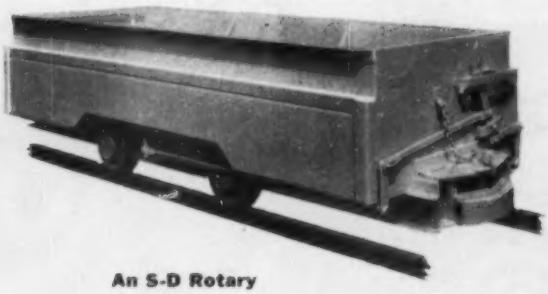
B-229

Another New Mine Car Development from Sanford-Day. . .

S-D "ONE-DOOR" BOTTOM DUMPING CAR OFFERS INDUSTRY MANY ADVANTAGES . . .

. . .Metal and Non-Metallic Mining's

● **AND RUGGEDNESS OF DESIGN!** This new one-door bottom dumping designs offers greater cubic foot capacity for the same overall dimensions than has been possible to obtain in granby or rocker dump designs. Also, we have a much better balanced car in this new S-D "One-Door" Car with a low center of gravity for improved trackability. This outside frame construction also permits us to build these cars with a door opening that is maximum width between bottom flanges of rails. Also, outside frame construction lends itself well to the use of spring mounted trucks, which may be added to meet your specific requirements. Note there are no inside gussets or stiffeners on inside of car body or materials side of specially designed door to retard clean shedding of materials. This feature has particularly impressed users. On this car flares are on 60 degree. Cars are designed and built to meet the requirements of loading by overshot loader or chutes. This new car is also submerged arc welded for parent metal strength as are all Sanford-Day mine cars! Also, overall length may be increased. Let us analyze your problem and supply you with this car in the proper flare design to meet the shedding requirements of your material. *Manufactured exclusively by Sanford-Day, Knoxville, Tenn.*

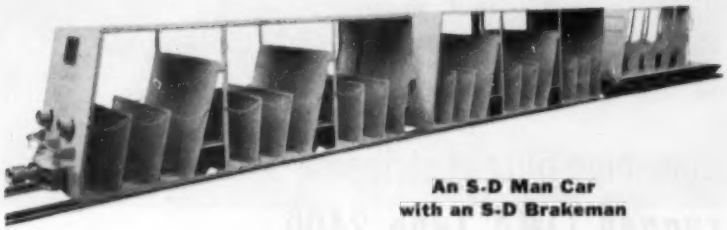


An S-D Rotary

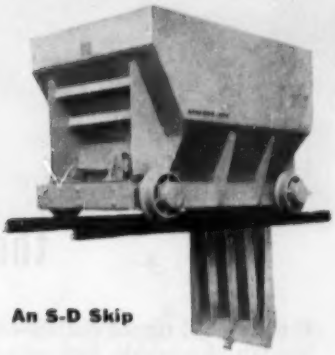
An S-D Granby

An S-D Automatic with
Spring-Mounted Trucks

An S-D Rocker

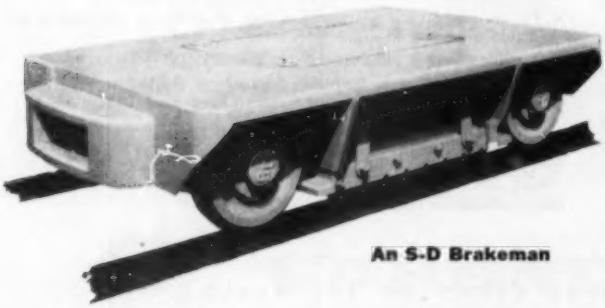


An S-D Man Car
with an S-D Brakeman

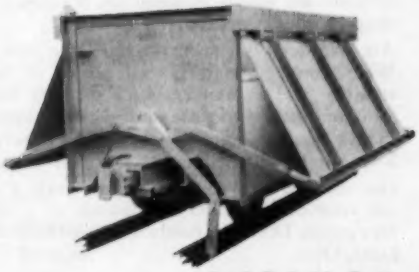


An S-D Skip

Super Market for Mine Cars



An S-D Brakeman



An S-D Gable Bottom

Sanford-Day Iron Works, Inc., Knoxville, Tenn.

SANFORD-DAY

AD 6095

Quality-built for dependable, high-output stripping and loading...

the big, rugged LIMA Type 2400

It takes a big, rugged machine like the Type 2400 to give you fast, dependable, high-output stripping and loading service. This heavy-duty 6 yd. shovel is quality-built by Lima to stay on the job, deliver peak operating performance on the tough assignments. It's easily convertible for dragline operation, too.

Air operated clutches make the Type 2400 easy to handle. Wide, long crawlers give it plenty of bearing area for stability and maneuverability on soft footing. Tandem mounted drums give maximum cable capacity. These plus Lima's quality "extras" (see right) have made the Type 2400 a hands-down favorite with users around the world.

Get the full story on the quality-built Type 2400 today. See your nearby Lima distributor, or write Construction Equipment Division, Baldwin-Lima-Hamilton Corporation, Lima, Ohio.

COMPARE QUALITY! No other machine gives you as much as LIMA!

1. Piston-type dirt seal rings and retainers in crawler rollers.
2. Moving parts are flame or induction hardened for longer life.
3. Two-shoe swing and propel clutches; air control.
4. Anti-friction bearings at all important bearing points.
5. Big capacity drums and sheaves are easy on cables.
6. Propel and swing gears and power take-off are enclosed in a sealed oil bath.
7. Torque converter (standard equipment).
8. Wherever you are, you can depend on skilled service and nearby warehouse stocks of parts to keep your LIMA on the job continuously.

COMPARE and you'll specify LIMA for shovels (½ yd. to 6 yds.), cranes (to 110 tons) and draglines (variable). Smaller capacities available on rubber.

DISTRIBUTORS IN PRINCIPAL CITIES OF THE WORLD

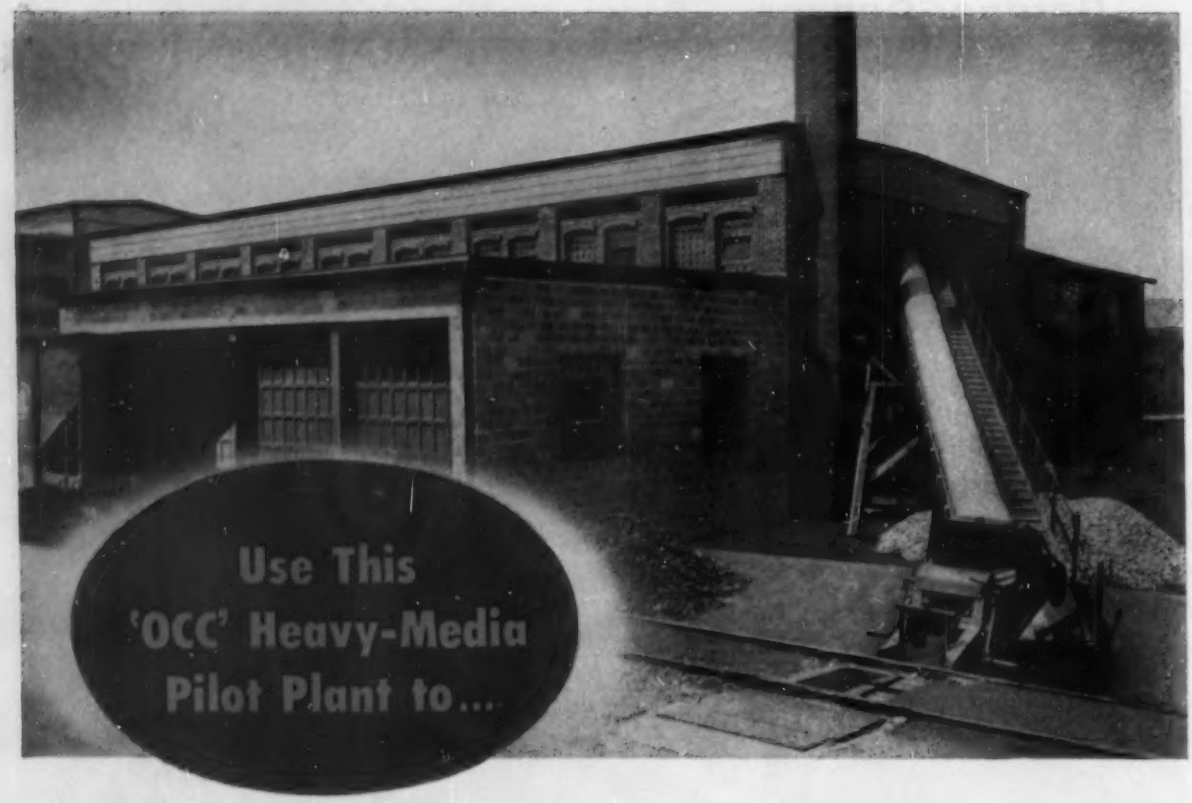
LIMA SHOVELS • CRANES • DRAGLINES • PULLSHOVELS

BALDWIN-LIMA-HAMILTON

Construction Equipment Division—LIMA WORKS

OTHER DIVISIONS: Austin-Western • Eddystone • Electronics & Instrumentation • Hamilton • Loewy-Hydropress • Madsen • Pelton • Standard Steel Works

Cable Address: LIMASHOVEL, Lima, Ohio, U.S.A.

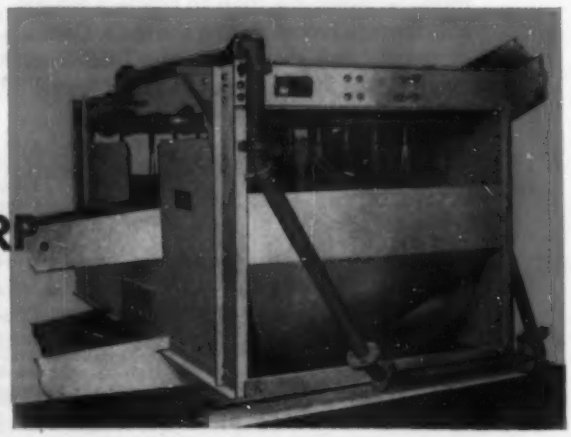


- **help you spell out your separating problems**
- **predetermine yield & efficiency of new equipment**

If you are planning new heavy-media equipment or plant, we believe you will find OCC's complete pilot plant and laboratory services of inestimable help. At the White Haven, Pa., plant pictured above you can see a commercial-size OCC Vessel treating truck or carload quantities of your feed. Samples will be taken in your presence and prepared for final product assay. In short, this OCC service enables you to confirm laboratory test results on a full operating scale and to determine yield and efficiency factors before you invest in equipment.

We invite you to join the increasing number of mining men who are visiting our pilot plant. We will be pleased to have you see in operation our complete, full-size HM system employing an OCC separatory vessel. This OCC unit has set entirely new standards of design, operating simplicity and metallurgical efficiency.

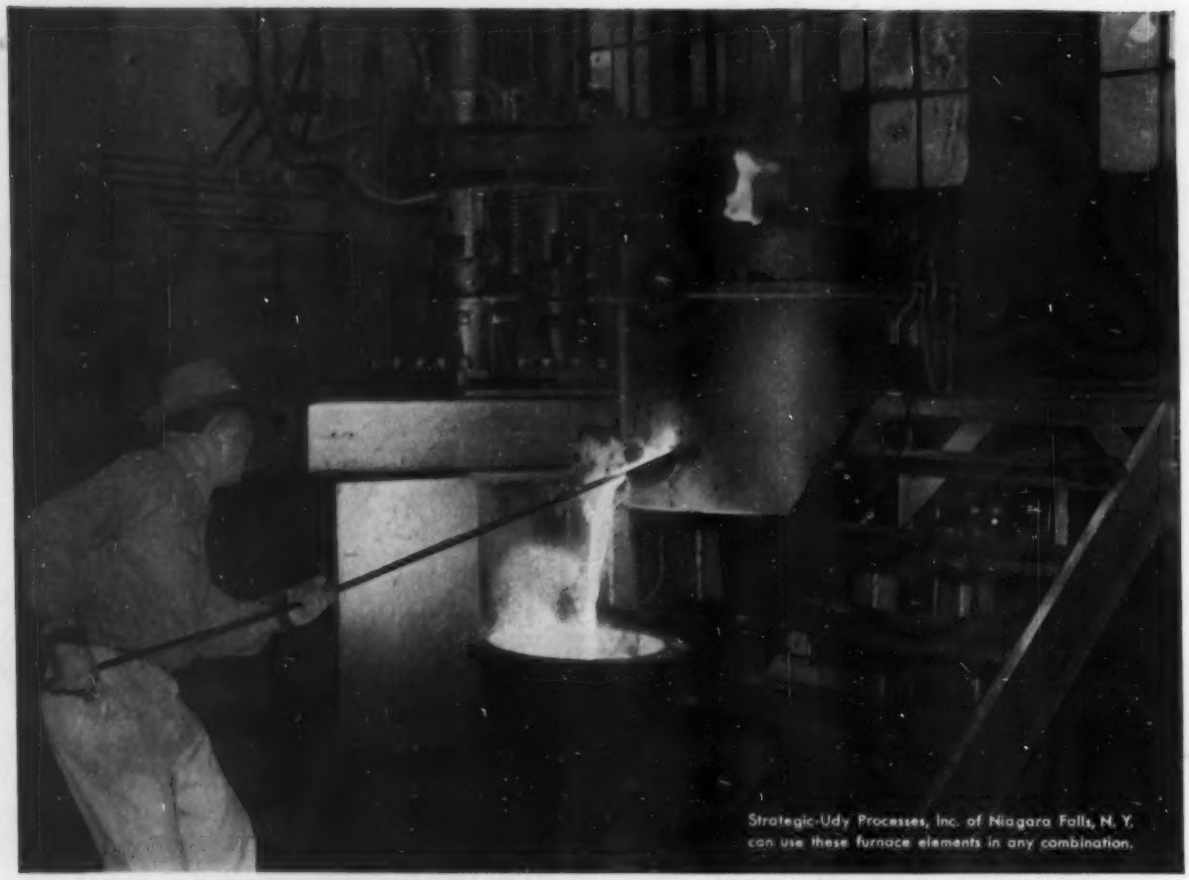
Below, OCC Heavy-Media Vessel: float and sink discharges on left, feed chute on right. U. S. and foreign patents.



The ORE & CHEMICAL CORP.

DIVISION: MINING AND MILLING MACHINERY
80 BROAD STREET, NEW YORK 4, N. Y.

Serving Both Hemispheres



Strategic-Udy Processes, Inc. of Niagara Falls, N. Y. can use these furnace elements in any combination.

Three furnace shells + Lectromelt* electrode equipment + a versatile power transformer

provide flexibility for Electrothermic Research

The standard 100 KW. Lectromelt melting furnace set-up you see here—a shell with a basic lining and a third with an acid lining—electrodes in a triangular or straight line configuration—power input at any one of fifty voltages from 6 to 460 volts. Think of a combination that might possibly be needed in high temperature, electric arc research and the chances are it can be obtained here at Strategic-Udy Process.

The specialty of this research organization is developing electrothermal methods for treating such ores as high iron bauxites, high iron titanium, sulfide, manganese, tungsten, zirconium ores and the like. If the answer is high temperature metallurgy, this Lectromelt Furnace equipment provides the means.

Catalog No. 105 describes many types of smelting furnaces. For a copy write Lectromelt Furnace Company, 324 32nd Street, Pittsburgh 30, Pa. (a McGraw Electric Company Division).

Manufactured in . . . ENGLAND: Birlec, Ltd., Birmingham . . . FRANCE: Stein et Roubaix, Paris . . . BELGIUM: S. A. Belge Stein et Roubaix, Bressoux-Liege . . . SPAIN: General Electrica Espanola, Bilbao . . . ITALY: Forni Stein, Genoa . . . JAPAN: Daido Steel Co., Ltd., Nagova

*REG. T. M. U. S. PAT. OFF

WHEN YOU MELT... *Lectromelt*

Serving Both Hemispheres

of the Mining World

CYANAMID

REAGENT NEWS

"ore-dressing ideas you can use"

Gold Operators: —Flocculate Slimes *And* Prevent Deposition of Lime Salts With AEROFLOC® Reagents

AEROFLOC Reagents not only serve as powerful flocculants for slimes, they also are very effective in sequestering or complexing calcium, thereby preventing deposition of troublesome lime salts.

This double benefit from the use of the AEROFLOC Reagents has been proved at several cyanidation operations. AEROFLOC 548 and 552 appear to be most effective for this double use. Unlike the polyphosphates which sequester calcium but disperse pulps, the AEROFLOC Reagents sequester calcium and *flocculate* pulps.

A Cyanamid field engineer writes concerning a western United States cyanidation operation, using 0.03 lb. per ton of AEROFLOC 548 Reagent:

> *"Subject has had no trouble with lime deposition in bags and pipes, etc., since using AEROFLOC. In this CCD plant AEROFLOC 548 gives pulp density of 42% solids and clear thickener overflow, as against 25% solids and dirty overflow without AEROFLOC."*

Besides flocculating and settling slimes, AEROFLOC 548 and 552 Reagents may also perform the following useful functions at your plant:

1. Prevent blinding of filter cloth caused by lime salts precipitating in the fibers, resulting in lower labor costs, fewer acid washes and longer cloth life.
2. Prevent formation of incrustations of lime salts which cause stoppages in pipes, launders, jigs, deaerating equipment, etc.
3. Lower calcium content of gold precipitate with resulting increase in gold content, cutting down fluxing and melting costs.

For further information on this useful application of the AEROFLOC Reagents, contact any Cyanamid field engineer or Cyanamid Mineral Dressing office.

AMERICAN CYANAMID COMPANY

MINERAL DRESSING DEPARTMENT

30 ROCKEFELLER PLAZA, NEW YORK 20, N. Y.

Cable Address – Limenitro, New York

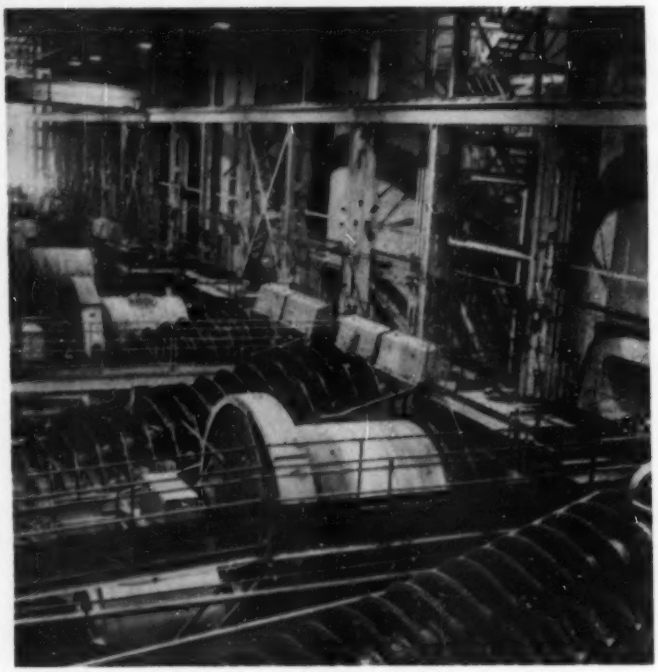
NORTH AMERICAN CYANAMID LIMITED
160 Bloor Street East; Toronto 1, Ontario, Canada
CYNAMID DE MEXICO, S. A.
Apartado No. 26012, Mexico 12, D. F., Mexico

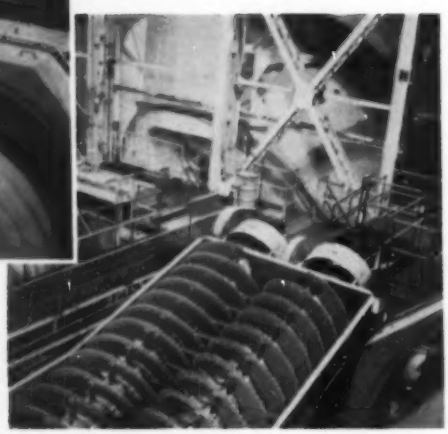
CYANAMID PRODUCTS, LTD., Bush House,
Aldwych, London W. C. 2, England
SOUTH AFRICAN CYANAMID (PTY.) LTD.,
P. O. Box 7552, Johannesburg, Union of South Africa

E. P. CADWELL, Belen 1043,
Of. 6, Lima, Peru
G. B. O'MALLEY, MALCOLM GLEN,
377 Little Collins St., Melbourne C. 1, Australia

CLIMAX again selects AKINS

In 1934 Climax Molybdenum Company installed its first Akins Classifiers. Since then Akins has been selected for use in each of their new units... convincing evidence of dependable, low cost mechanical and metallurgical performance. The most recent order of four Akins Classifiers was for the primary circuits of new Units 10 and 17. Other Akins at Climax include 14 primary classifiers, 5 regrind classifiers and 7 by-products classifiers.





For complete details on the advantages of AKINS... write for Catalog 55C

Akins — the ORIGINAL spiral type classifier.

COLORADO IRON WORKS CO.

1624 17th Street • Denver 2, Colorado

AKINS CLASSIFIERS • SKINNER ROASTERS • LOWDEN DRYERS

Sales Agents and Licensed Manufacturers in Foreign Countries

A SUBSIDIARY OF THE MINE & SMELTER SUPPLY CO.

TOURNATRACTOR is a 208 hp tractor that *runs* on rubber instead of *crawling* on tracks.

Since its *introduction in 1946,* this electric-controlled tractor has been used successfully in every kind of climate, terrain, material, and on every type of tractor application, all around the world, by *thousands of owners.*

Their *job records prove* that Tournatractors can outwork crawler-tractors by as much as 2 to 1 where job conditions allow the use of its higher speeds.

Remember, too, that for this extra speed and greater production capacity, plus all the other "bonus" Tournatractor advantages described below, *you invest no more,* and *pay less for operation and maintenance,* than for any crawler-tractor of similar power.

Does speed fit your job?

Check these advantages for your mine!

Speed on the job...
Tournatractor pulls, dozes, pushes at speeds 2 to 3 times faster than any crawler. You change gears instantly, waste no time shifting, go up to 8 mph in reverse.

Mobility between jobs...
Tournatractor travels job-to-job at high rubber-tired speeds. Big, low-pressure tires drive anywhere—you need no planking or trailers—have no loading or unloading delays.

Lower maintenance...
Lubrication takes only a few minutes a shift on Tournatractor as compared to 15 minutes or more on a crawler. No cleaning of tracks, grousers, and other fittings.

Fewer repairs...
A set of tires or tracks costs about the same. But tires last 2 to 3 times longer than tracks under most conditions . . . without the usual maintenance expenses.

Ample flotation, traction...
Each tire grips area approximately 2 feet wide. Lugs bite deep to give plenty of traction. Low-pressures increase flotation, absorb shocks, aid compaction.

Less loss of power...
208 hp diesel drives through dirt-sealed anti-friction bearings to free-rolling wheels. All gears and bearings automatically lubricated . . . all parts easily accessible.

Shifts instantly...
Constant-mesh transmission eliminates delays in changing gears . . . saves vital momentum . . . gives you any gear ratio instantly.

Torque converter available...
This simple, dependable, low-pressure system provides the equivalent of an infinite number of gear ratios automatically selected to best balance load and torque.

Easier to operate...
Less jolt and jar reduces stress and strain on both operator and machine. Fingertip electric controls let operator work faster, with less end-of-shift fatigue.

Improves safety...
Low center of gravity, all-around visibility, quick response of controls make Tournatractor exceptionally safe to operate. Multi-disc air brakes have more than *4 times* the braking surface of most big tractors and trucks.

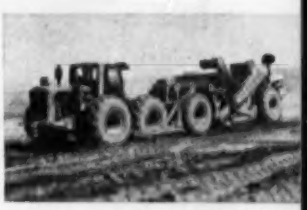
Interchangeable equipment...
Bulldozer, Angledozer, Root Rake, Snow Plow—all interchangeable—may be mounted on Tournatractor. Tilt mechanism and down-pressure attachment also available.

Easy to keep busy...
Stripping overburden, pushing scrapers, cleaning up around shovels, or handling a wide variety of utility jobs around the pit, Tournatractor's speed and power will save you time and money.

Call or write us for a Tournatractor demonstration on your job. See for yourself the advantages of this versatile, high-speed, rubber-tired tractor.

Tournatractor—Trademark Reg. U.S. Pat. Off. T-733-M-b

Tournatractor pulls Carryall-Scrapers twice as fast as crawler-tractors. Hauls more in less time.



Versatile rig combines power and fast-positioning for efficient push-loading in any materials.

Tournatractor utilizes mobility and speed for quick clean-up around shovels and on pit floor.

LeTourneau-WESTINGHOUSE Company

Peoria, Illinois

A Subsidiary of Westinghouse Air Brake Company

Look What's Happened to Classification . . .

Wet classification — important unit operation throughout the process industries — demands special equipment and a wide range of designs. Typical of this trend to specialization is the new, ultra-modern phosphate rock washing plant of Armour Fertilizer Works near Bartow, Florida. No less than nineteen individual Dorr "Classifiers" of five radically different designs are being used for size separation.

1 A Dorr Classifier, upper left, makes a 65 mesh separation with rake product capacity of 240 long tons per hour splitting to two 16½ pocket Duriron Jet Sizers for further classification ahead of screens.

2 Combined overflow from Classifier and Sizers is treated in this 50' dia. Dorr Type H-1 Hydroseparator.

3 Desliming at 150 mesh is accomplished in fourteen 24" dia. DorrClone Separators equipped with Vactrol control devices. Units respond automatically to changes in feed . . . produce uniform underflow at 70-75% solids.

4 High capacity Dorr Type AX Hydroseparator handles flotation concentrates prior to further treatment.

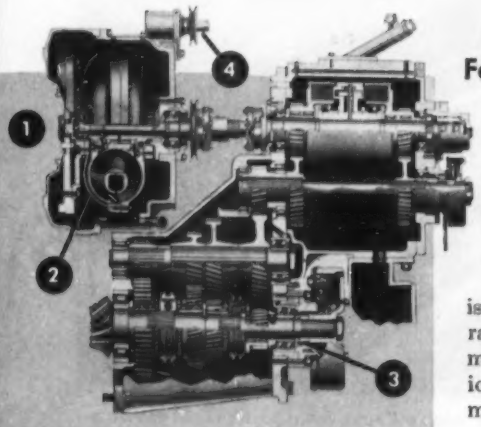
Dorr-Oliver is the only manufacturer of a complete line of wet classification equipment. When you call on Dorr-Oliver you can be sure you'll get an unbiased recommendation . . . the *right* equipment to solve your particular classification problem.

DorrClone and Vactrol T.M. Reg. U.S. Pat. Off.

DORR-OLIVER
INCORPORATED
WORLD-WIDE RESEARCH • ENGINEERING • EQUIPMENT
STAMFORD • CONNECTICUT • U.S.A.

190 HP

NEW POWER-Flow Adams 660
with Torque Converter



1. 190 hp Cummins or General Motors Diesel Engine (not shown).

2. Torque Converter — Adams single-stage type. Multiplies torque 3-to-1—provides infinite gear ratios—absorbs shock loads to prevent engine lugging or stalling.

3. Constant-Mesh Transmission—with power clutch for forward-to-reverse motion without shifting—4 speeds forward to 27.4 mph, 4 reverse to 24.4 mph.

4. Tail-Shaft Governor—adjusts engine speed automatically to maintain constant grader speed preselected by the operator.

Forward speed to 27.4 mph — reverse to 24.4

New POWER-*Flow* Adams 660 works at all times at fastest possible speed and highest efficiency. Its torque converter automatically balances speed and applied power to match the load. Engine torque is multiplied 3-to-1 in infinite gear ratios. Tail-shaft governor supplements torque converter by automatically adjusting engine speed to match variable load conditions.

This maximum flexibility in power transfer provides a cushion against load shock, reduces wear and maintenance on engine and transmission. When bucking varying heavy loads, frequent gear-shifting is eliminated . . . no engine stalling. Operators get *more* work done — with *less* effort.

Shift forward to reverse with simple foot control

Adams power-shift clutch shifts instantly in any gear range — from forward to reverse, reverse to forward — with the simple movement of a foot pedal. This leaves operator's hands free for steering and for more accurate control of blade.

POWER-Flow "660" offers many extra advantages:

Power Steering — gives the "feel" of hand steering, with hydraulic power doing the work.

Double-Action Hydraulic Braking System — applies pressure to brake on transmission as well as to brakes of 4 tandem drive-wheels.

Engine Rubber-Mounted—with no vibration transmitted to machine. Reduces operator fatigue.

Foot Accelerator — makes driving on highways and through traffic as safe and easy as driving a truck.

Six Big Tires — 14.00 x 24 — adequate traction and flotation for work in any material or footing.

Slide-Shift Moldboard — shifts easily, right or left, for long reaches.

Optional Equipment — includes Power-Shift Moldboard, Scarifier, Cab, Bulldozer, Elegrader, V-type Snow-Plow and/or Wing, Snow-Blo Wing, and Rotary Snow-Plow.

Look into POWER-Flow Adams 660

See how this fast, 190 hp grader can help keep your heavy work ahead of schedule. *Write for details.*

Adams, POWER-Flow—Trademark AG-1262-G-b-6

LeTourneau-WESTINGHOUSE Company

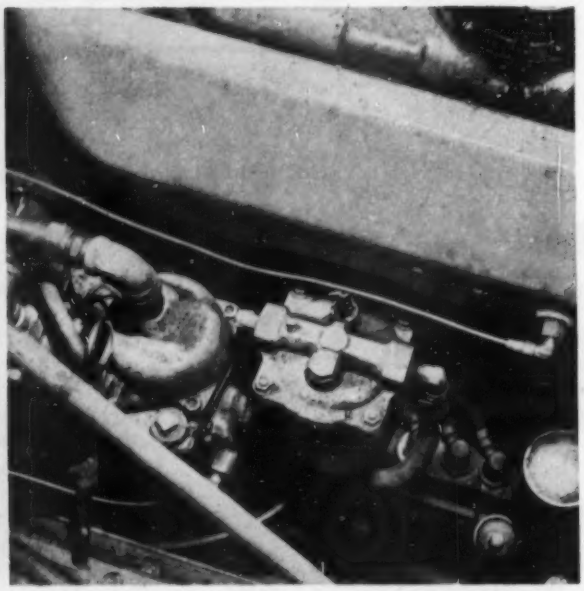
Peoria, Illinois

A Subsidiary of Westinghouse Air Brake Company

The Engineer's Field Report

CASE HISTORY
PRODUCT Chevron Pressure Primer System
FIRM Consolidated Freightways Inc., Portland, Oregon

Pressure Primer System starts diesels on 1st or 2nd turn with regular batteries—at minus 40°



BELOW ZERO starting temperatures are common 5 months a year for Consolidated Freightways equipment operating in Mountain and Plain States. Two hundred and forty-four of the company's tractors are equipped with the Chevron Pressure Primer System. Since this installation, rigs start on first or second turn at 40° below zero—using regular equipment batteries! Normally in these sub-zero temperatures, regular batteries give out after about 4 turns. Sure starts plus the fact engines are primed with Chevron Pressure Primer bulbs, controlled from within the cab, saves Consolidated Freightways important man-hours and speeds operating schedules. Picture above (left) shows a Chevron Pressure Primer Discharger mounted on steering column. Highly volatile priming fuel is atomized through tubing into manifold (right) under 250 lbs. pressure.

FREE FOLDER tells you more about Chevron Pressure Primer System and how to install it on different engines. Write or ask for it today.

FOR MORE INFORMATION about this or other petroleum products of any kind, or the name of your nearest distributor, write or call any of the companies listed below.

CHEVRON

TRADEMARK "CHEVRON" REG. U. S. PAT. OFF.

Why Chevron Pressure Primer System helps starting

Volatile Chevron Priming Fuel atomizes in induction system at temperatures as low as -65°F. Pressure or weakest spark from engine fires mixture.

Simple, rugged discharger prevents fuel leakage. Small, safe steel bulbs protect fuel from water and dirt.

STANDARD OIL COMPANY OF CALIFORNIA, San Francisco 20 • STANDARD OIL COMPANY OF TEXAS, El Paso
THE CALIFORNIA OIL COMPANY, Perth Amboy, New Jersey • THE CALIFORNIA COMPANY, Denver 1, Colorado

Fast D Tournapull, owned by Texas Lightweight Aggregate Co., gathers speed leaving processing plant for 1-mi. trip to loading area. This one "D" — plus crawler-mounted front-end loader, and a tandem-disc plow — replaced a fleet of 4 tractors and 2 towed scrapers.

At Haydite plant, one "D" replaces hauling fleet

moves same quantity in 1/3 less time!

Haydite is the tradename for lightweight expanded clay and shale aggregate, manufactured by Texas Lightweight Aggregate Company at the Stafford, Texas plant a few miles southwest of Houston. Black clay is broken up into marble-sized chunks, heat-expanded in rotary kilns, then cooled. The rock-hard finished aggregate is sold to ready-mix plants and manufacturers of concrete products for lightweight concrete and masonry units.

To keep its Rotary Kiln Haydite aggregate plant in Stafford, Texas, supplied with black clay, Texas Lightweight Aggregate Company, a division of Texas Industries, Inc., relies on one D Tournapull and a crawler-mounted front-end loader with tandem-disc plow. The "D" — working 16 hrs. daily — replaces 4 slow-speed tractors and 2 towed scrapers that worked around the clock to supply plant at the same rate.

The clay used is plastic, and very dense . . . hard as a rock when dry . . . soft and slippery when wet. The trick is to excavate it with just the *right* moisture balance — then haul direct to kilns or stockpile it in a sheltered area for future use. Condition of clay deposits at any given time depends on the weather of many preceding days and must be disced properly to maintain proper moisture for special loading.

Hauls over 2 to 4-mi. cycles

Sometimes, when stockpiles run low, a large amount of clay must be moved in a few hours to supply the kilns. Strip-mine areas are about a mile from the processing plant. Because good-sized yardages have to be loaded and moved fast, Texas Lightweight Aggregate finds Tournapull just the right machine. Working alone, "D" handles a job that previously required many machines.

Single Tournapull supplies materials

Total excavation, loading, pit-to-stockpile hauling, and dumping on shed, is handled by this single Tournapull. Rig self-loads as much as 6½ loose yds. per trip . . . hauls up to 1 mi. to stockpile sheds at speeds to 29.5 mph.

Spreads in tight quarters

Dumping at the plant involves careful maneuvering. The stockpile is next to the kilns, under a large shed. Turning space is restricted. The "D" frequently has to climb up and dump over previous stockpiles, with limited overhead clearance. 90° turn, electric power-steer through geared king-pin lets this LeTourneau-Westinghouse earthmover maneuver easily into the shed . . . spread . . . and swing out for another load in seconds.

"They turn fast and they're maneuverable," commented Richard Messer, Stafford Plant Superintendent. "They get out quick and back quick — both on the pick-up and spread, that differential helps us work good in mud during wet weather."

Get facts for your type work

If your earthmoving operations require steady production, plus hauling over a considerable distance, it will pay you to investigate the advantages of the 9-yd. D Tournapull, or the larger 18-yd. "C" or 25-yd. "B" sizes. Let us show you owner-verified facts on Tournapull production for *your* type of work.

"D" turns as it dumps on clay stockpile. In another 10 seconds, rig will be returning at high speed to loading area.

Tournapull—Trademark Reg. U.S. Pat. Off. DP-1051-M-b

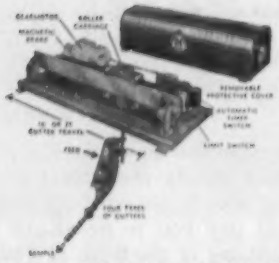
LeTourneau-WESTINGHOUSE Company, PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company

DENVER CAN SUPPLY COMPLETE EQUIPMENT FOR YOUR MILL

One Responsibility

Crushers, Screens, Feeders, Ball-Rod Mills, Classifiers, Jigs, Pumps, Samplers, Agitators, Conditioners, Flotation, Thickeners, Filters, Dryers, Ore Testing and Mill Design Services.

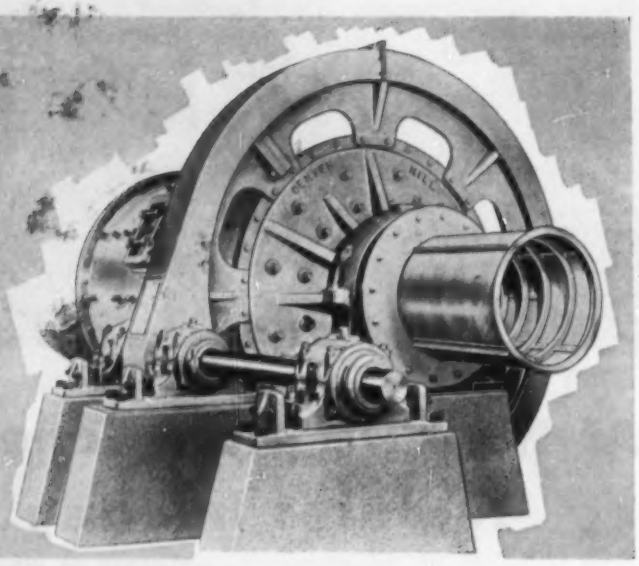


DENVER AUTOMATIC SAMPLERS
. . . for Positive Mill Control

- Accurate Sampling
- Representative Sampling
- Uniform Sampling
- Rugged Construction

Denver Equipment Co. can supply you with a variety of samplers to meet the many different problems involving size of material (either wet or dry); amount of sample; and frequency of sample cuts.

For complete information, WRITE FOR BULLETIN NO. S1-B4.



COMPARE SPECIFICATIONS AND PRICE OF DENVER STEEL-HEAD BALL OR ROD MILLS

INCREASED CAPACITY—Savings in Initial Cost

The size of a DENVER Ball or Rod Mill is determined by the *working diameter* inside the liners, rather than diameter of the shell, as many other mills are measured. Therefore, DENVER *Mills have up to 32% more capacity*—with resulting savings in initial cost, since you can buy a shorter mill for the same volume of feed. Sizes from 30″x18″ to 7′x16′.

GREATER STRENGTH—Longer Ball Mill Life

DENVER Ball or Rod Mill heads are cast from electric furnace steel, giving greater strength and longer life. Trunnions are designed for low bearing pressure.

COMPARE SPECIFICATIONS—PRICE

Every engineer planning a new Ball or Rod Mill installation will want to study the specifications of DENVER Mills.

1. Larger working diameter—more grinding capacity.
2. Larger bearing surfaces—low bearing pressure.
3. Electric cast steel heads—greater strength.
4. Choice of liners, gears and drive—greater flexibility.
5. Standard construction—faster delivery.
6. Complete wet or dry, single or two-stage systems.

WRITE FOR BULLETIN NO. B2-B13

"The firm that makes its friends happier, healthier and wealthier"

DECO ENGINEER — DENVER EQUIPMENT 24 HOUR SERVICE COMPANY

DENVER EQUIPMENT CO.

1400 Seventeenth St. • Denver 17, Colorado
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MEXICO, D. F. • LONDON • JOHANNESBURG

Mining World

THE IMPORTANT MINING MAGAZINE EVERYWHERE

December 1956

INTERNATIONAL PANORAMA

POTRERILLOS, CHILE—Andes Copper Mining Company is making plans to produce 100,000 annual tons of copper from its El Salvador mine by the end of 1959. Ore reserves have been increased to 200,000,000 tons assaying 1.6 percent copper.

BAKER, CALIFORNIA—Bear Creek Mining Company geologists have staked a number of mining claims in the old base metal mining district of Halloran Springs. Bear Creek is Kennecott Copper Company's exploration subsidiary.

SILVER BAY, MINNESOTA—Reserve Mining Company's taconite concentrator is operating at 1,000,000 annual tons over designed capacity. Plans are being considered to increase plant capacity by 10 percent

CHRISTMAS, ARIZONA—Inspiration Consolidated Copper Company plans to build a 2,500-ton-per-day copper concentrator here to treat O'Carroll Bed ore.

LIMA, PERU—The Compania Salitrera Anglo-Lautaro has received a $25,000,000 loan from the Export-Import Bank of Washington, D. C. to increase plant facilities for production of solar evaporated nitrate and by-products.

SEVEN ISLANDS, QUEBEC—Pickands Mather & Co., has taken a lease on the Wabush Lake iron ore property of Canadian Javelin Limited. The lease gives PM right to purchase up to 2,000,000 tons per year of iron ore pellets which Javelin is to produce.

BISBEE, ARIZONA—Phelps Dodge Corporation expects to produce a record 225,000 tons of refined copper from its own mines in 1956.

GRANTS, NEW MEXICO—Phillips Petroleum Company has paid Holly Minerals Corporation $1,750,000 cash for a ¼ interest in Holly's Ambrosia Lake uranium properties.

GARFIELD, UTAH—Calera Mining Company is installing an electrolytic cobalt refining unit at its cobalt refinery here. The plant will be in operation in late 1957 and will produce high purity metal.

MT. ISA, AUSTRALIA—Mining Corporation N. L. in its first diamond drill hole cut 669 feet of copper formation here. Drilling sought a southern extension of the copper ore body of Mount Isa Mines Ltd.

SAN FRANCISCO, CALIFORNIA—The Office of Defense Mobilization announces that it has reached stockpiling goals for mercury, iridium, platinum, and battery-grade manganese.

SOUTH ALLIGATOR RIVER, AUSTRALIA—The largest masses of high-grade pitchblende yet mined have been hoisted from the El Sharana mine of Northern Uranium Development (N. L.) and Uranium Mines (N.L.). The largest weighed 2,156 pounds and assays 83 percent U_3O_8.

TAWAS CITY, MICHIGAN—National Gypsum Company has started stripping of a major deposit of gypsum here for a new open-pit mine to provide gypsum rock for two new plants in Illinois and Ohio.

BUCHANS, NEWFOUNDLAND—Buchans Mining Company, Ltd. is planning to sink a new 14-foot-diameter round shaft 4,000 feet to develop deep lead-zinc-copper ore. Buchans is a subsidiary of American Smelting and Refining Company.

SALT LAKE CITY, UTAH—Vitro Uranium Corporation has signed a contract with the United States Atomic Energy Commission for production of uranium concentrate from December 1958 through March 31, 1962. Vitro is spending $1,200,000 for plant expansion here to meet purchase schedule.

MAYBELL, COLORADO—Union Carbide Nuclear Company, a division of Union Carbon and Carbide Company, has acquired property of Trace Elements Corporation and will probably build and operate the uranium mill originally planned by Trace. The latter had recently received a uranium purchase contract from the U.S. Atomic Energy Commission.

Bear Creek Mining Awards East Tintic Shaft Contract

Bear Creek Mining Company, Kennecott Copper Corporation's exploration subsidiary, has awarded Centennial Development Company of Eureka, Utah the contract to sink a 1,000-foot exploration shaft in Utah's East Tintic district. Bear Creek is seeking lead-zinc-silver ore bodies indicated by geological and geophysical prospecting and diamond drilling. Under terms of a recent agreement, Bear Creek is bearing all costs for the major development program on 10,000 acres of ground controlled by Chief Consolidated Mining Company, Tintic Standard Mining Company, South Standard Mining Company, Eureka Standard Consolidated Mining Company, and Eureka Lilly Consolidated Mining Company. The Tintic group companies will receive royalties on any ore mined. (See MINING WORLD, August 1956, page 51.)

Centennial Development will use a Cryderman shaft mucker for the new shaft, according to H. Spencer, Centennial manager.

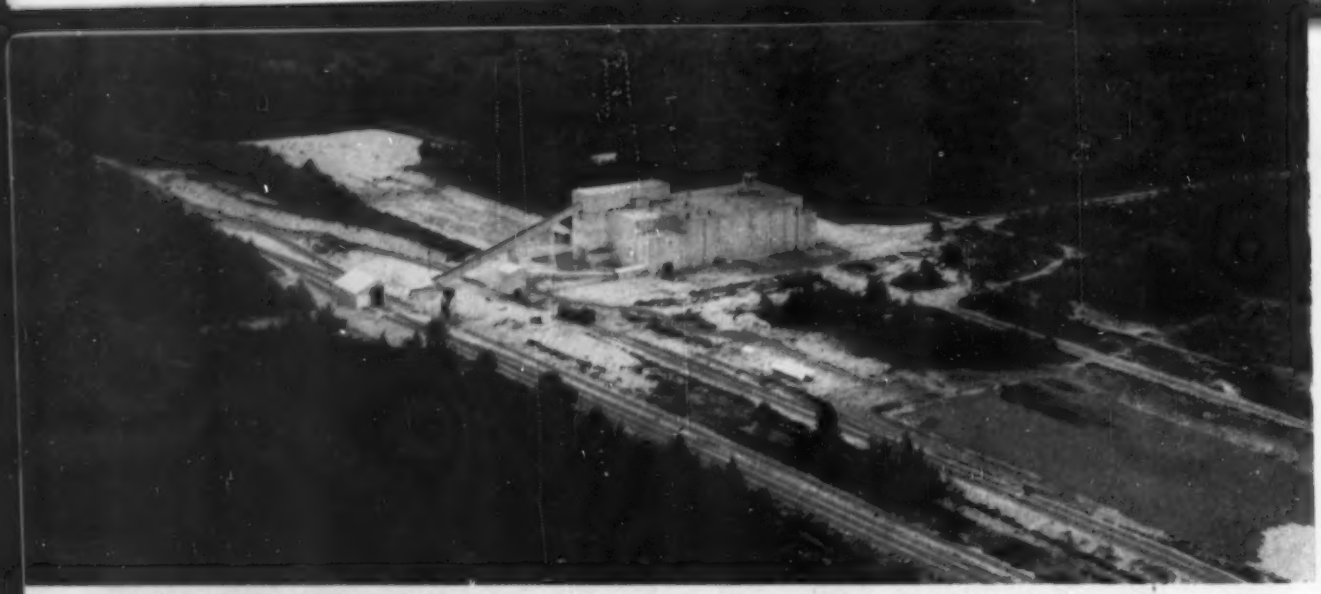
Bolivian Mining Reported At Critical Point Now

The Bolivian government-sponsored report on the mining industry in that country prepared by the United States firm of Ford, Bacon & Davis has recently been completed.

The report concludes that a critical point has been reached in the economic existence of the Mining Corporation of Bolivia which operates the nationalized mines for the government. Lack of management, technical staff, economic planning, and ore reserves are listed as adversely affecting the mining industry. Only three mines now have substantial ore reserves; Unificado, Animas, and Viloco. Bolivia's largest tin mine, Catavi, has become a marginal producer, the report adds. In the next five years mineral output will decrease 11 per cent for tin, 68 for lead, 81 for silver, 96 for zinc, 31 for copper, 26 for antimony, and 97 for gold, the report estimated. Tungsten output will increase 5 percent.

The report recommended revamping of the Corporation; that a general manager of great skill be hired; and that the government make a final settlement with the owners of nationalized mines so that foreign invesment capital will feel that it is once again welcomed in Bolivia. The surest way to improve the mining situation and the economy of Bolivia is to create a sound and favorable investment climate in Bolivia, the report recommends.

In January—U_3O_8 Metallurgy at Mines Development



MICHIGAN'S FIRST PELLETIZING plant and the world's first plant to commercially pelletize specular hematite flotation concentrate. This view shows Marquette Iron Mining Company's new plant at Eagle Mills, Michigan. All raw materials arrive on inbound track at left; pellets are shipped out over track to right. There is no tailing.

Eagle Mills Pellet Plant Opens New Era For Michigan Hematite

By GEORGE O. ARGALL, JR.
Editor

Steel companies operating blast furnaces in the United States are demanding both higher grade furnace feed and feed having superior physical properties—porosity, narrow size limits, and ability to support column charge in the upper section of the furnace. This means an ever increasing market for higher grade ores and specially prepared furnace feed. An even greater market for special feed for direct reduction to iron and/or steel may not be too far away.

The Cleveland-Cliffs Iron Company as operating manager for the Marquette Iron Mining Company is ready to meet these demands for premium iron units by supplying high-grade pellets from the new Republic mine pelletizing plant at Eagle Mills, Michigan. Several boat loads of these pellets were shipped before the Great Lakes freeze-up and will be tested at Lower Lake steel furnaces during the winter. Meanwhile, the Eagle Mills plant will continue to produce and stockpile pellets for the 1957 shipping season.

These pellets are more than just pellets. They are the first commercial pellets ever made from Michigan specular hematite (jasper) ore—and, what's more, the first ever made from hematite flotation concentrate in the United States. To produce these pellets required a new plant using new methods and new equipment at Eagle Mills, and a new flotation plant and open-pit mine at Republic, Michigan, 30 miles away.

While the Republic concentrating plant is new, its process is not; it having been used initially at the nearby Humboldt plant, also operated by Cleveland-Cliffs. This article describes the pelletizing plant operation at Eagle Mills and the new agglomerating process. A subsequent article will fully describe the Republic mining and milling operations which are an integral part of the overall operation.

Marquette Iron Mining Company is jointly owned by The Cleveland-Cliffs Iron Company, the Inland Steel Company, the Jones & Laughlin Steel Corporation, The Wheeling Steel Corporation, and the International Harvester Company. It takes its name from the Marquette Iron Range of Michigan's Upper Peninsula where the plants are located.

Process Facts

Six raw materials are used to produce one product at the plant. There is no tailing. These raw materials are, in order of tonnage used: Republic flotation concentrate assaying 63.5 percent iron and 7.0 to 8.0 percent silica; process coal, anthracite No. 5 buckwheat; limestone, ⅜ by 1 inch chips; bentonite, ground, Western swelling type; ignition coal, anthracite, No. 1 buckwheat; and liquid propane.

The process, strictly speaking, is a pyrometallurgical operation in which the only change that takes place is the agglomerating and heat hardening of the flotation concentrate. The other raw materials act as binding, hardening, and heating agents for the concentrate. There is no purifying or upgrading involved as the pellets assay almost identically the same as concentrate. However, a number of other metallurgical processes are used, including both wet and dry grinding, wet and dry classification, filtering, dry mixing, and pelletizing.

Materials handling is most important in that such widely diversified products as high-gravity concentrate, dry powder, coal dust, hematite-water pulp, filter cake, hot sinter gases, hot air, liquified propane, and warm pellets are regularly conveyed, pumped, blown, sucked, or otherwise moved.

All Inbound Rail Shipments

All raw materials are delivered to the plant by the Lake Superior and Ishpeming Railroad. Concentrate, coal, and limestone are unloaded from bottom dump cars and conveyed to the top of round concrete storage si-

los; two with total capacity of 5,300 long tons for concentrate; one with 975 long tons capacity for process coal; one at 246 long tons for ignition coal; and one for limestone chips at 470 long tons.

Powdered bentonite from covered hopper cars is blown into a 220-long-ton capacity silo by a Fuller-Kenyon pneumatic system. Limestone is pulverized in the plant and blown into a storage silo holding 375 long tons. Propane arrives in tank cars.

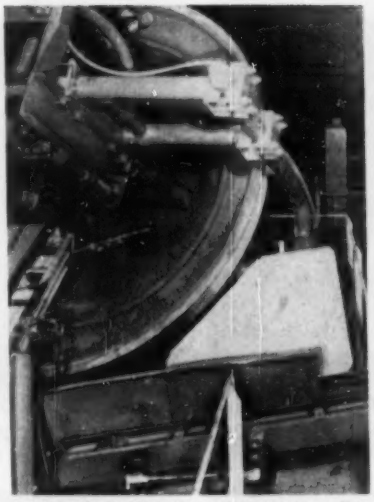
Both process coal and limestone can be drawn separately from storage silos for dry pulverizing in a Hardinge No. 16 disc (Loesche) roll mill. The ground product is classified in a Gyroter classifier; pulverized coal is blown into the four coal day bins (feed for balling discs described below); and limestone is blown into the pulverized limestone silo. Hot air is blown into the classifier to dry the material and to carry the ground product into the centrifugal classifier on top of the pulverizer.

Regrind for Structure

Republic concentrates are ground in an 11-4 by 10-6 Hardinge Tricone mill, then thickened, and filtered, to give the right structure, correct moisture, and percentage of fines for balling. Concentrate is drawn from the bottom of each storage silo by four, 72-inch Link-Belt table feeders and conveyed to the mill. Undersized fired pellets (see below) are also reground in this mill. Pulp overflows to a 30-foot-diameter Dorr-Oliver thickener. Thickened pulp at 65 percent solids is pumped to two 6-foot diameter, 7-disc, Eimco Agidisc filters.

While this is the normal flowsheet, there are two other options at this point. First alternate can be used if the structure and fineness are satisfactory, but moisture content is too low; then concentrate is pulped and sent directly to thickener. The second alternate is to send a satisfactory concentrate directly to the day bins, bypassing the grinding-filter circuit.

Filter cake is conveyed to one of four 100-ton day bins (balling disc feed). The filter cake (hematite concentrate) is conveyed over a Transportometer which activates Transportofeeders under both the bentonite and powdered limestone storage silos. It is possible to vary the feed rate of bentonite and powdered limestone as they are drawn, conveyed, and dumped onto the concentrate belt. The belt with the concentrate, bentonite, and powdered limestone then passes through a Pekay Mixer Muller where a thorough mixing and fluffing takes place.



LABORATORY BALLING DISC used in perfecting process and equipment. Eagle Mills units are larger, rotate in other direction, and are fed from top.

Bentonite acts as a binding or cementing agent for unburned pellets and limestone increases the strength of the fired pellets. When the limestone percent is dropped, the ignition coal percentage must be raised.

The mixed hematite-limestone-bentonite is conveyed to the top of the mill and stored in four 100-ton-capacity day or balling disc feed bins. The mixture is drawn off the bottom of each bin to a conveyor belt by a 96-inch Link Belt table feeder. Each belt passes over a Transportometer which actuates a Transportofeeder on each of the four pulverized process coal bins. Belts drop the mixture onto the top of the balling discs while the correct proportion of coal is fed out of the coal bins into chute leading to the coal rerolling ring.

Balling Discs for Pellets

To put it simply, hematite concentrate is difficult to aggregate compared to magnetite. This is the most difficult problem at Eagle Mills. The reason is that the individual hematite particles form flat, slick, fish-scale-like plates in contrast to the more cubic magnetite grains. Accordingly, grains can adhere to only two faces in contrast to six or more for magnetite. At best, the contact between particles is weak.

Long laboratory experiments developed the balling discs for balling hematite concentrate. Those used in the plant were manufactured by the McDowell Company, Inc., Cleveland, Ohio. A balling disc is an 18-foot-diameter, saucer-shaped disc which is rotated around a central axis. The inner 15-foot-diameter section has a flat surface, plus four fillets, where the actual balling takes place. A 1½-foot-wide peripheral band is the coal rerolling section. From the flat center portion, the outer edge is three feet high. From center to edge there are four 9-inch-deep by 6-inch-wide steps or fillets. These steps have a sloping side set at 45° angles to both the vertical riser (parallel to rotating axis) and the flat step (vertical to the axis).

The entire disc revolves clockwise at seven revolutions per minute. It can be steepened to cut down on ball size and raise capacity, or flattened to increase ball size and reduce capacity. Normal angle is 60°.

The disc is essentially a hollow shell in that fillets prevent a build-up of a mass of pellets so that weight is reduced and of course the horsepower required for rotation. The bottom of the disc and the fillet sides and bottoms are all lined with expanded metal. There is no mixture contamination, and the adhesion between rolling pellets and disc face is good so that lifting action is increased. To keep the center of the disc clean, an

GROVER J. HOLT, (left), general manager of Cleveland-Cliffs' ore mining department, is in charge of the plant. CALVIN BEJORNE (center) is Eagle Mills superintendent, and DICK GREENWALT (right) is plant metallurgist.

BALLING DISC showing oscillating scraper at top right, water spray in center, and coal chute to coal rerolling band at left.

CASCADING SNOW BALLING action of the rolling pellets is clearly shown here as they jump into coal rerolling band.

COAL COATED GREEN PELLETS are conveyed from balling discs to Dwight-Lloyd grate machine as shown in this picture.

FIRED PELLETS emerging from the updraft cooling section of the 224 foot long machine. Note pallet height at left.

oscillating scraper moves across the face.

Close moisture control is important for balling. An adjustable water spray located near the center can be directed to any spot on the disc.

How Pellets Form

Feed to each of the four discs drops from individual conveyor belts through cylindrical chutes into the center section of the disc. Looking into the disc and comparing positions on the disc with the numbers on your watch, this feed pipe is at 2:00 o'clock. The oscillating scraper moves across one half the saucer face at 3:00 o'clock. The surface ahead of the feed pipe is cleaned at the 11:00 o'clock position and any adhering mixture drops back into the mass of rolling pellets.

As the feed drops directly onto the cleaned center section, the centrifugal force of the disc carries it down and around to about 6:00 o'clock where it passes underneath the cascading snow balling action of the rolling pellets. Individual pellets carry around to about 10:00 o'clock before gravity exceeds centrifugal force and they drop and roll down and up over the fillet (steps). It actually takes mass to rise from step to step and to overflow the vertical ring from top fillet into the coal rerolling band. This ring is just high enough that it actually takes a bounce of only the fully formed pellets to leave the balling section.

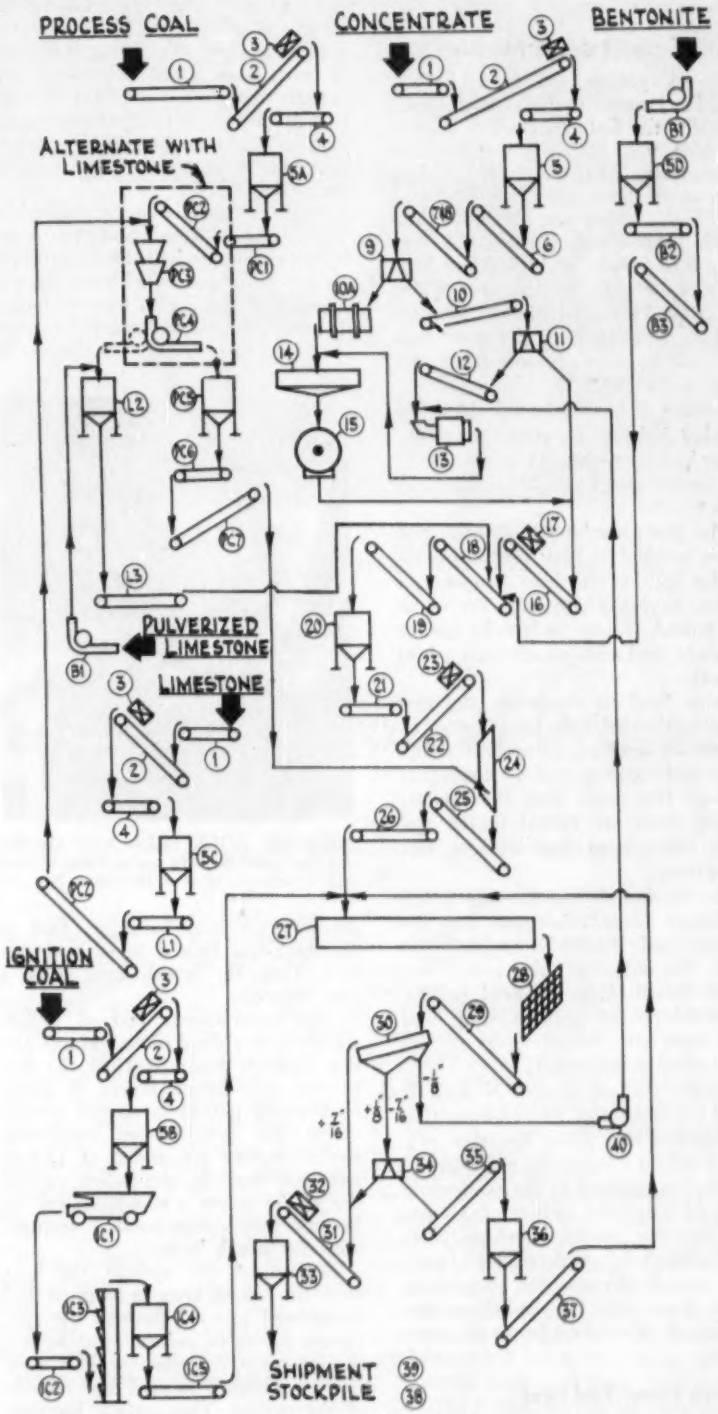
In practice pellets formed on the first or A disc are made smaller than those on the next three. This makes better air distribution through the subsequent layers of pellets on the grate machine. Fine coal, four to five percent of pellet weight, is fed to the coal reroll ring at 6:00 o'clock position through a vertical drop pipe. The green pellets, ⅜ to ½ inch, roll and cascade through this fine coal and are completely coated. Pellet size is not increased in this ring. Possibly there is some hardening of pellets by rerolling, but the primary purpose is to coat the entire surface with a thin layer of the pulverized coal.

Disc capacity is limited to a maximum of 30 to 35 tons per hour of rolled pellets. Deepening of the disc is not practical to increase capacity because when fillets are over 9 inches deep shearing of the seed pellets takes place.

Cleveland-Cliffs believes that the discs provide a satisfactory answer to hematite balling. Green pellets of uniform size are produced in the disc without screening and recirculation of undersize, as is the practice when balling drums are used; also, the coal coating in the reroll ring eliminates the need of a separate coal coating drum. By balling and coal coating on the same disc, a simpler materials flowsheet has been developed which eliminates conveyor belts.

The coal coated green pellets overflow the outer edge of the coal coating ring at 7:00 o'clock position to a short conveyor belt leading to the

Flowsheet Eagle Mills Pelletizing Plant



LEGEND

Concentrate Flow
2,222 Long Tons Per Day
Flotation concentrate from either Republic or Humboldt received in drop bottom railroad cars
1. Feeder, 4 by 10 feet.
2. Conveyor belt, 42 inches wide.
3. Transportometer.
4. Shuttle belt, 42 inches wide.
5. Storage silos, concrete, two with total capacity of 5,300 long tons.
6. Table feeders, two 72-inch Link-Belt units under each silo.
7. Two conveyor belts, 24 inches wide.
8. Conveyor belt, 24 inches wide.
9. Splitter.
10. Conveyor belt, 24 inches wide.
10A. Tumbling drum.
11. Splitter.
12. Conveyor belt.
13. Regrind ball mill, Hardinge, 11-4 by 10-6 Tricone.
14. Thickener, Dorr-Oliver, 30-foot diameter, with No. 8 diaphragm pump.
15. Disc filters, two, 6-foot diameter, 7-disc, Eimco Agidisc.
16. Conveyor belt, 24 inches wide.
17. Transportometer.
18. Pekay Mixer Muller now operating here.
19. Conveyor belts, 24 inches wide.
20. Furnace feed (Day) bins, four with 100-ton-capacity each.
21. Table feeders, one 96-inch Link-Belt under each Day bin.
22. Conveyor belt, one from each feeder.
23. Transportometer, one on each belt.
24. Ballwell Balling Discs, four 18 feet in diameter.
25. Conveyor belts, one from each saucer.
26. Oscillating feeders, one from each belt.
27. Grate machine, Dwight-Lloyd, updraft, 224 feet long, 6 feet wide, 36-inch high pallets.
28. Grizzly.
29. Shaking conveyor, 4- by 26-foot.
30. Double-deck vibrating screen, Simplicity, 5 by 14 feet.
31. Conveyor belt.
32. Transportometer.
33. Pellet loading bin.
34. Splitter
35. Belt conveyors, three.
36. Bin, bedding fines storage.
37. Conveyor belt.
38. Winter stockpile area.
39. Rail shipment to Marquette dock.

Process Coal Flow
114.0 Long Tons Per Day
Bituminous No. 5 Buckwheat received in drop bottom railroad cars and unloaded same as concentrate. See Nos. 1 to 4 above.
5A. Storage silo, concrete, 975 long tons capacity.
FC1. Table feeders, two 60-inch Link-Belt.

←Alternate with→ Limestone
- FC2. Conveyor belts, two.
- FC3. Roll mill pulverizer, No. 16 Hardinge (Losche mill with Gyroter classifier).
- FC4. Fuller-Kenyon pneumatic system, unit No. 2.

FC5. Process coal storage (Day) bins.
FC6. Transportofeeders.
FC7. Conveyors.

Limestone
50.0 Long Tons Per Day
Chips, 12 by ½ inch, received in drop bottom railroad cars and unloaded the same as concentrate. See Nos. 1 to 4 above.
5C. Storage silo, concrete, 470 long tons capacity.
L1. Feeder, 24-by 48-inch Syntron.

←Alternate with→ Process Coal
- FC2. Conveyor belts, two.
- FC3. Roll mill pulverizer, No. 16 Hardinge (Losche mill with Gyroter classifier).
- FC4. Fuller-Kenyon pneumatic system, unit No. 2.

L2. Storage silo, concrete, 375 long tons capacity.
L3. Transportofeeder.

Bentonite
12.5 Long Tons Per Day
Western swelling type, sodium base received in dry tank cars and unloaded by suction.
B1. Fuller-Kenyon pneumatic system, unit No. 1.
5D. Storage silo, concrete, 220 long tons capacity.
B2. Transportofeeder.
B3. Belt conveyors, three.

Ignition Coal Flow
8.0 Long Tons Per Day
Anthracite No. 1 Buckwheat received in drop bottom railroad cars and unloaded the same as concentrate. See Nos. 1 to 4 above.
5I. Storage silo, concrete, 246 long tons capacity.
IC1. Truck to outside dump pocket.
IC2. Feeder, 24-inch, bar flight.
IC3. Bucket elevator, 5- by 8-inch.
IC4. Bin.
IC5. Vibrating feeder, 24- by 72-inch Syntron.

Pulverized Limestone
50.0 Long Tons Per Day
Possible alternate to limestone chip shipments. Received in dry tank cars and unloaded same as bentonite.
B1. Fuller-Kenyon pneumatic system, unit No. 1.
L2. Storage silo, concrete, 375 long tons capacity.

Dwight-Lloyd grate machine. Four belts from the four discs feed into the grate machine at right angles to its long axis.

Dwight-Lloyd Grate Machine

Green pellets are fired in the world's largest updraft, and, incidentally, the first Dwight-Lloyd grate machine used on hematite flotation concentrate. Total length is 224 feet with an effective wind box length of 168 feet. There are 28 individual wind boxes. Each pallet is 2½ feet long, 6 feet wide, and has 3-foot-high sides. Pallets, grate bars, side walls, etc. are all made of Mallex. Because updraft firing is used, the grate bars and pallet sides' temperatures are only about 500° F. during firing. Therefore it is anticipated that they will last indefinitely, even though the sinter bed temperature reaches 2,450° F. Grate speed is 28 inches per minute.

The grate machine is also the first to use vertical jet blast propane burners for ignition and heat. Propane, of course, having a very high Btu value per pound, is easy to handle, ignites instantly, and adds no siliceous ash to the cake.

From feed to discharge, the machine is divided into four zones: 1) downdraft ignition, 2) updraft firing, 3) updraft cooling, and 4) downdraft cooling. Hot gases from the updraft cooling zone are cycled to the updraft firing zone for efficient Btu utilization.

The machine is also the first to fire six layers of materials and has the deepest bed depth—36 inches. The layers in order of placement are: 4-inch hearth layer of fired pellets, sprinkle-layer of ignition coal, and four successive 8-inch layers of the coal-coated green pellets.

Briefly, the advantages of updraft firing are: minimum Btu consumption —remember that firing hematite pellets is a heat consuming endothermic reaction as opposed to the exothermic firing of magnetite pellets at Minnesota taconite plants; machine parts last indefinitely as described above; and updraft obviates the sucking of steam down into the bed from the heating of succeeding layers of green pellets.

Hearth Layer Fed First

In brief, the layering and firing steps are as follows: The pallets first pass under the bedding fines bin from which a level hearth layer bed of fired pellets is spread 4 inches deep on the grate bars. It takes 16 tons of these pellets to cover the grate. The grate then moves under the ignition coal bin from which 0.3 percent by weight of Buckwheat No. 1 anthracite coal is sprinkled uniformly on top of the hearth layer. With only 0.3 percent ignition coal being sprinkled, the coal layer is not uniform or continuous over the hearth layer. Roughly, one chip of coal covers one square inch of surface. Too much coal at this point would cause clinkering in the hearth layer.

Next the pallets move under the down-draft ignition hood where six burner-manifolds with blast tip burners for the propane fuel bring the top 2 inches of the hearth layer to incandescence. Bottom of the layer remains relatively cool. The coal in the hearth layer ignites and furnishes fuel to maintain the hearth layer temperature. Thus, the hearth layer forms a heat reservoir.

LOESCHE ROLL MILL with Gyroter classifier used for dry pulverizing of coal and limestone. It is a Hardinge No. 16.

The incandescent bed of pellets travels over a dead plate and into the first updraft windbox. Then the first of the four 8-inch layers of green coal-coated pellets is spread evenly across the bed by an oscillating feeder. Pellets are added at 12-foot intervals. Actually, the pellets roll off the feeder down a stainless steel lip because they would break if dropped onto the hearth layer.

Because of the updraft, the heat from the hearth layer is stripped and transferred upward through the successive layers of pellets. Heat ignites the coal-coated pellets with a continuous burning around the outside of the pellets. This surface burning, plus the heat stripped from the hearth layer, fires and hardens the pellets.

The hot wet gases from the updraft firing zone are collected in four type N Rotoclones which remove dust and return it to either the ball mill or thickener feed.

The pallets with their 36-inch-deep bed now move into the updraft cooling zone where atmospheric air from outside the plant building is blown through the bed. The resultant hot dry gases are recirculated back to the updraft firing zone. A 500-horsepower electric motor drives the blower on the cooling air stream and a 1,250-horsepower motor is used on the recirculating fan.

The final three wind boxes are down-draft cooling so that any excess heat left in the hot top is transferred to the cooler pellets underneath. Remember that heat and firing proceeded upward as pallets and pellets travelled through the machine.

Screen, Fired Pellets

The fired pellets, weighing 110 to 112 pounds per cubic foot, having a porosity of about 30 percent, and assaying 63 percent iron and 8 percent silica, drop off the end of the sintering machine onto a sloping grizzly.

The grizzly feeds a 4- by 26-foot vibrating feeder conveyor which, in turn, feeds a 5- by 14-foot, double-deck, Simplicity screen. Top deck oversize, plus-7/16-inch, drops to a conveyor belt which passes over a Transportometer for weighing, and angles upward out of the building to the pellet loading bin. Railroad cars can be loaded directly under the bin for summer shipment, or trucks can be loaded for winter stockpiling through the same bottom draw-off gates.

Second screen deck oversize drops to a splitter. This fraction is recirculated to the sintering machine part of the time for the hearth layer. The remainder of the time it is finished product, joining the plus-½-inch portion.

The second deck screen undersize, minus-3/16-inch, is recirculated to the ball mill feed to go through the entire plant again.

Regular hardness tests are made on the finished pellets.

Cleveland-Cliffs has a long and successful record of pioneering work in iron ore preparation: HMS, cyclones, spirals, and froth flotation.

The pelletizing plant carries ore preparation a step further. This is the first pyrometallurgical plant that Cleveland-Cliffs has operated and the process is proving satisfactory. Designed capacity has not yet been reached due to requirements in making changes in the materials handling system usually experienced during a break-in period. Changes and modifications are now being made and it should not be long before the plant has been completely shaken down and operating at capacity.

START of the Northwest Project involved cut and fill work to level the site for the proposed 15,000-ton-per-day hoisting facility at the Ryan shaft. Some 40,000 yards of overburden were moved with a 3-yard shovel and rear dump trucks. In the background to the south is Big Butte, a familiar Montana land mark. Sinking will be underway soon.

Anaconda Pushes Underground Project

By STANLEY DAYTON
Associate Editor

Three new mine expansion programs are under investigation for the Butte, Montana mines of The Anaconda Company. Two of them, the East and the Continental Projects, are in an early stage of examination, but work has started on the underground Northwest Project.

In many respects, the Northwest is one of the most important developments slated for Butte, because it has such far reaching effects. Basic development will require the sinking of two new shafts. One will be a concrete lined installation (the Ryan) with four skipways capable of hoisting 15,000 tons per day. The other, known as the Missoula, will be a smaller, timbered shaft primarily for carrying out development and for servicing the Ryan. With these two shafts Anaconda will be able to:

(1) Develop a large section of the Butte hill bounded on the south by the Anselmo and Original mines, on the east by the Steward, Mountain Con, and Lexington mines, and on the west by rhyolite flows. Several copper-zinc veins are known to exist in this area which has been virtually undeveloped by past activities.

(2) Provide relief for deep level hoisting at several of the older mines bordering the undeveloped northwest area where existing facilities were never planned for such great depths.

(3) Plan for future recovery of large low-grade zinc ore bodies known to exist in certain areas of the Butte hill by tying these areas to the proposed Ryan shaft with modern underground tracked haulageways.

One of the most interesting aspects of the Northwest Project is that underground development hasn't touched this district after nearly 90 years of continuous mining activity. The Missoula shaft will be centered in this district and present plans are to establish levels at 150-foot intervals from this shaft to mine ore from zinc-copper veins. Four main levels will be established at the Ryan shaft and two of the upper levels will connect with the Missoula. The lowest one, the 4,400 level, will hole the Mountain Con mine where stoping is carried out on the 4,400 level with development work going even deeper. Hoisting facilities are hard pressed at the Mt. Con shaft since production is coming from a great many levels. The Ryan shaft will relieve some of the load and permit an increase in selective vein mining which, of course, yields a far greater metal recovery than the more spectacular but low-grade copper developments of the Greater Butte Project and the Berkeley open pit.

Production at the Northwest Project will grow by stages with full production of 15,000 tons per day the ultimate objective. Initially production will come from veins to be developed from the Missoula shaft and from deep level Mt. Con operations. Looking further to the future, potential areas of low-grade zinc in the Badger-Elm Orlu area 7,000 feet east of the Ryan shaft may be developed through the facilities which will be available.

The surface site of the Ryan shaft is now being cleared and sinking will be underway by January 1957. At the Missoula, the headframe has been erected and raising of the first 180 feet from the Alice tunnel has started.

HEADFRAME of the Missoula shaft was erected in a central location within the Northwest Project area. This shaft when completed will service underground mining activities.

HAULAGEWAYS of the Northwest Project will connect with the Kelley mine, shown above, on the 2,100 and 3,400 levels. Ryan shaft will be similar to the Kelley.

The total initial outlay required to develop the Northwest Project is $22,800,000. Of this amount, $12,600,000 will be spent on the construction work and $10,200,000 will be required for the underground development.

The Ryan shaft is to be located 5,350 feet north of the present Anselmo installation and about 4,000 feet west of the old Alice shaft. This area was selected because it will be well removed from any possible mining operations, and thus will be entirely free from the effects of subsidence. The smaller Missoula shaft will be centrally located in the northwest district about 3,500 feet northeast of the Anselmo mine. The Missoula shaft provides access to this area and will be the opening which will service underground development and exploration headings in the area.

Zinc on Upper Levels

The mineralization consists of copper-zinc with zinc predominating in the extreme fringe areas of the northwest district and upper levels of the central portion of the district. This is in conformance with the well-known zonal arrangement of Butte ores which has been well described by Reno Sales, and others, whereby copper occurs in a central zone surrounded by zinc mineralization which, in turn, gradually changes to manganese-silver ore at the outer periphery. The line of demarcation between the zones is never clear cut; the mineralization of one gradually grading into another. The central core of copper seems to widen with depth and narrow somewhat at shallow horizons. Quite commonly a vein which is worked mainly for the zinc content on upper levels, grades into copper on the lower levels. Similarly, if a vein is traced along its length outward from the central zone it shows the gradation from copper to copper-zinc, then to zinc, and finally to manganese and silver.

Ryan Level Interval

Four main haulage levels will be established at the Ryan shaft on the 1,000, the 2,100, the 3,400, and the 4,400 levels. The 2,100 and the 3,400 levels are on grade with main haulageways at the Kelley mine where low-grade copper ore is being recovered by block caving. Connections between the Ryan and the Missoula shaft will be made on the 1,000 and the 2,100 levels.

At the timbered Missoula shaft, zinc-copper veins already known on the 2,100 level of the adjoining Anselmo mine have been earmarked for development from haulage horizons at a vertical interval of 150 feet. Through the years at Butte, the 150-foot level interval has proved most economical for selective vein mining. An added advantage of this spacing is that twice this distance is 300 feet which provides a reasonably good height for caving methods.

Specifications for the Concrete-lined Ryan Shaft

Rock section: 38 by 9 feet
Interior dimensions: 35 feet 4 inches by 6 feet 9 inches
Five compartments (4 hoisting with 1 manway in the center) all separated by concrete dividers, or steel centers
Proposed depth: 4,670 feet
Hoisting capacity: 15,000 tons per day
Levels: Four at 1,000; 2,100; 3,400; 4,400 feet
Hoist: 14-foot-diameter, double drum
Power: 6000-horsepower motor
Headframe: 180-foot steel structure with two idler towers
Skips: 252-cubic-foot capacity—14.5 tons loaded
Lining: Reinforced concrete

Specifications for Timbered Missoula Shaft

Rock section: 17 by 7 feet
Two compartments measuring 4 feet 8 inches in the clear
One compartment measuring 4 feet 4 inches by 4 feet 9 inches inside the timber
Timber: To be 12 by 12 inches with 10-inch dividers
Depth: 2,300 feet
Level interval: 150 feet
Headframe: 85-foot steel structure
Sinking hoist: 500-horsepower, double-drum unit

All ore developed above the 850 level of the Missoula will be transferred to the 1,000 level of the Ryan and hoisted to the surface. Ore below the 850 level will be transferred to the 2,100 level of the Ryan where it will be hoisted to the surface.

Ryan 2,100 Level

On the 2,100 level of the Ryan, connections will be made with the Missoula, Badger, Kelley, and Mountain Con Mines with an ultimate tie to the Leonard through the Kelley mine. Development work is already in progress on this horizon. Ultimately it will figure importantly in future plans, for on the 2,100 level a long cross-cut will be driven to the Badger-Blackrock-Elm Orlu area where large tonnages of low-grade zinc are known to exist. This level will hole the Badger shaft which will be used for service in future mining of this low-grade material. The distance between the Ryan and the Badger is about 7,000 feet and this would be one of the longest hauls involved for the Northwest Project. Work on the 2,100 level is underway at present.

On the 4,400 level a connection will be made between the Ryan and the Mountain Con, and preparations have been made to start this work. Recent successes in deep development of the Mountain Con mine have produced good ore showings in the deep horizons. The Mountain Con shaft was recently extended another 300 feet to the 5,000-foot mark. The lowest level fairly well developed at this mine is the 4,500. Plans are to hoist all Mountain Con production originating below the 4,400 level to the 4,400 level where it will be trammed to the Ryan shaft for hoisting to the surface.

The Ryan 1,000 level will just be a simple connection between the Missoula and the Ryan. The 3,400 is being driven between the Ryan, the Mountain Con, and the Kelley mine.

Trolley Haulage

On all these levels, trolley haulage will be utilized. The headings will be driven 9½ by 9 feet in cross section where timber is not required. Where ground support is necessary, drifts and crosscuts will be driven 11½ by 11 feet in cross section using 5 and 3 piece timber sets to hold the ground. Tie to cap clearance will be 8 feet 6 inches which will result in a trolley wire clearance of 8 feet 3 inches. Eleven-ton trolley locomotives will haul 205-cubic-foot-capacity mine cars. Track gauge will be 36 inches using 60-pound rail on a grade of 0.3 percent in favor of the load. Minimum radius of curves on the haulageways will be 150 feet.

RECENT SUCCESS in deep development of the Mountain Con mine has produced good ore showings on deeper horizons. The Ryan shaft will enable production of ore below the Mountain Con 4,400 level to be expanded.

Shaft Pockets

Pockets at the Missoula shaft will have a 3,000 cubic foot capacity and will be established at every level. At the Ryan shaft each level will have three pockets of 1,000 tons each with the exception of the 1,000 level. At the latter horizon, two pockets of 1,000 ton capacity will be excavated. The Ryan pockets will measure 16 feet in diameter inside a mine-rail, reinforced, concrete lining. The overall design will be such that any of the pockets can deliver ore to either one of a pair of skips. Thus it will be possible to hoist ore from any one level with all four skips in action simultaneously.

Sinking and concreting of the Ryan shaft will be contracted. Total cross-sectional excavation required will be 38 by 10 feet. The lining will be of reinforced concrete and compartments will be separated by concrete dividers where necessary. The shaft sets in the Ryan will be steel.

Surface Plant

The surface plant of the Ryan will include crushing and belt conveying facilities to dispose of ore to a 10,000-ton-capacity storage bin. Two parallel conveyors will transport the ore, crushed to minus-6-inches in size, 2,000 feet to the bin which will be built adjacent to the Butte, Anaconda & Pacific Railroad. The twin conveyors will be located normal to the long axis of the Ryan shaft with a down grade of approximately 6⅝ percent to the discharge point at an elevation of 130 feet below the feed end. Initially only one belt installation is planned, but provision is being made for the second belt as growth of mine production develops at the Northwest Project.

At the Missoula, work is already well along at the shaft. The headframe has been erected and raising of the first 180 feet to hole the surface has already started. This work is being conducted from the Alice tunnel at a turnout about 1,700 feet from the portal. The Missoula will be sunk from the Alice tunnel to its proposed depth of 2,300 feet after holing the surface. To facilitate handling of the muck below the Alice tunnel an auxiliary raise will be driven from the tunnel to daylight near the shaft collar. Shaft rounds below the tunnel level will be hoisted to the surface and dumped into the transfer raise which

PITTSMONT SHAFT is being re-opened to afford access to an area east of the Butte hill where favorable geologic conditions may result in the East Project. Upper section of shaft was in alluvium and steel spiling was used during re-opening.

LEONARD MINE now served by a shaft on the east side of the hill will some day figure in the master plan of underground development. The Leonard will be tied to the Ryan shaft through haulageways now connected with the Kelley mine.

will measure 8 feet by 8 feet inside the timber cribbing. The portal of the Alice tunnel is located at a railroad siding so that the muck can be disposed of easily.

East Project

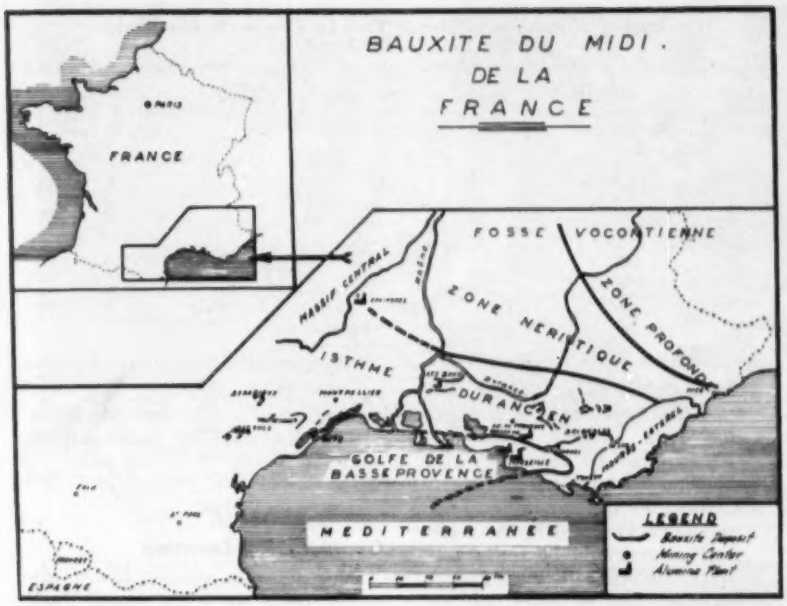
Two other very highly interesting projects are now under study in the area east of the Butte hill, and there is every possibility that they too will develop into major mine expansion programs of the Anaconda Company. Geologic indications point to conditions favorable for ore deposition below the alluvial covered valley between the Butte hill and the Continental Divide. Deep exploration of this area is being conducted from the 3,000 level of the Belmont mine and the 3,300 and 3,400 levels of the Leonard mine.

Exploration at higher horizons will be undertaken from the Pittsmont shaft which is now being reopened. Bedrock at the Pittsmont shaft occurs 404 feet below an overlying sand and gravel wash. Topography, drainage, and the nature of the alluvial deposit created a difficult sinking problem when the shaft was first put down a number of years ago. An excessive quantity of water was present and the wash approached quicksand consistency. When the shaft was reopened this year it was necessary to spile through many sections of the overburden. For this work rock bolts pointed at one end and pointed drill steel of 8 and 10 foot lengths were used as spiling. The steel was driven with sinkers or stopers with considerable success and saving over the time required to drive regular lagging as spiling material. As high as 65 lengths of the steel have been placed in a single shift. A diamond drill hole has been put down through the unopened section of the Pittsmont shaft and water is draining to voids in the Pittsmont mine which in turn will drain to other mines in the Anaconda system. Development of this area which has been labeled the East Project might very well involve another major shaft installation of the size of the Kelley and the proposed Ryan.

Continental Project

Still further east, near the foot of the scarp resulting from the Continental fault, churn drilling is being conducted with holes placed on 200-foot centers on a grid oriented north and south. Drilling has disclosed irregular shaped lenses containing oxidized, carbonate, and sulphide copper which occur in numerous stringers and veinlets in and around the fault zone. These lenses are found from the surface to a depth of 100 to 400 feet. Chalcopyrite is the principal sulphide mineral but the oxidation products—malachite, azurite, and cuprite—along with chrysacolla, compose a sizable proportion of the mineralization.

Actual development of this area as an open pit depends on the tonnage and grade disclosed as well as the results of metallurgical test work. The work, known as the Continental Project, is being carefully studied to determine if development is warranted. If the project appears favorable, it is entirely conceivable that a mill will be constructed near the mine. Cement copper precipitation facilities are already available at Butte and pregnant leach solutions could be treated in this or an expanded facility.



LOCATION of the various segments of the French aluminum industry are pinpointed by the map.

How French Bauxite Is Mined

Today, underground mining with modern mechanized equipment is supplanting open pits where bauxite was first discovered

By DR. G. DE WEISSE and R. LOUVAIN

Bauxite was first discovered and mined in the ancient city of Baux, in southern France. Once the possession of a rich and powerful family, today it is almost a desert; the town is in ruins, but Baux has followed the destiny of aluminum and has given its name to the ore which is found not far from the village.

Bauxite was first noticed at Baux in 1821 by an engineer named Berthier, but was mistaken for iron ore for a very long time because of its brick red color. After this discovery it was soon recognized in the Var Province, then in the Herault Province, and finally in the Department of Ariege, so that today bauxite represents the characteristic ore of the South of France. (The geologically favorable regions for bauxite in southern France are shown on the index map.)

The improvement of the patents of Heroult (1886) and Bayer (1887) brought the industrial start of aluminum around 1888. Certain qualities of bauxite were already being used by the abrasives industry when the cement industry began using bauxite in 1905 (electric furnace cements). Toward 1915, Portland cement and LaFarge cement were improved by the use of water jacketed furnaces. The rise of cement customers started in 1920, and they have now become the second largest consumer of bauxite in France, second only to the alumina producers.

Various other chemical industries use bauxite in small quantities. In 1955, these customers consumed French production in the following order: alumina, approximately 85 percent; cement, approximately 11 percent; refractories, abrasives, and others, around 4 percent.

French bauxite production (300,000 tons in 1913, 500,000 tons in 1934, and 1,000,000 tons in 1951) totalled 1,480,000 tons in 1955, employing 1,500 persons in its operations.

Quality of the Ore

The future of French bauxite mining is primarily a problem of its commercial quality. French bauxite is a mixture of boehmite ($Al_2O_3H_2O$) plus gibbsite ($Al_2O_3{\cdot}3H_2O$) or boehmite plus diaspore. There are practically no French bauxites containing the mixture: gibbsite plus diaspore.

French bauxites contain silica in the form of hydrated silicate of alumina or kaolin; iron in the form of anhydric oxide of iron; titanium in the form of rutile, probably TiO_2; and various other elements, particularly vanadium, gallium, etc., in very small quantities. To meet market specifications, different types of ore are blended.

For the French bauxite miner, there are two very distinct customers:

1) Those for whom the silica is the annoying impurity (so called "red" bauxites). These are: alumina and molten cement users who desire the percentage of alumina at 55, with a silica percentage lower than 6.0; Portland cement plants which desire 52 percent alumina with silica lower than 10.0; abrasives manufacturers who desire a bauxite with a SiO_2 ratio close to 0.5 (in which the percentage of silica is Fe_2O_3 less than 9.0).
2) Users for whom iron is the annoying impurity (so called "white" bauxites). These are refractories and chemical plants which desire 57 percent and

Dr. De Weisse and Mr. Louvain are geologist and chief mining engineer for the Société Anonyme des Bauxites de France.

Production of Bauxite in Metric Tons in France By Companies and By Uses in 1950 and 1955

Company	1950 Production	1955 Production	Locality Mined	Main Uses
Pechiney Union des Bauxites	385,353	724,521	Var Hérault Ariege	Alumina Cement Abrasives
Bauxites de France	154,992	259,437	Var Hérault	Alumina Alumina
Bauxites du Midi	80,670	188,616	Var	Alumina
Electro-Chimie d'Ugine	90,815	123,875	Var	Alumina
Comptoir de Vente	31,844	117,201	Var Hérault	Cement Refractories Abrasives
Others	0	69,529	Hérault Bouches-du-Rhône	Alumina Refractories Abrasives
Total	743,674	1,483,179		

higher alumina with Fe_2O_3 less than 5.0 percent. French bauxites with alumina percentage higher than 60 are rare. Also bauxites containing less than 5 percent Fe_2O_3 are rather rare, and often localized in small ore bodies (generally near the outcrops). Consequently these grades represent for the miner only an occasional and secondary market.

Therefore, for the French bauxite miner, the current industrial bauxite is "red," monohydrate, in the form of boehmite, containing 50 to 60 percent alumina and less than 6 percent silica.

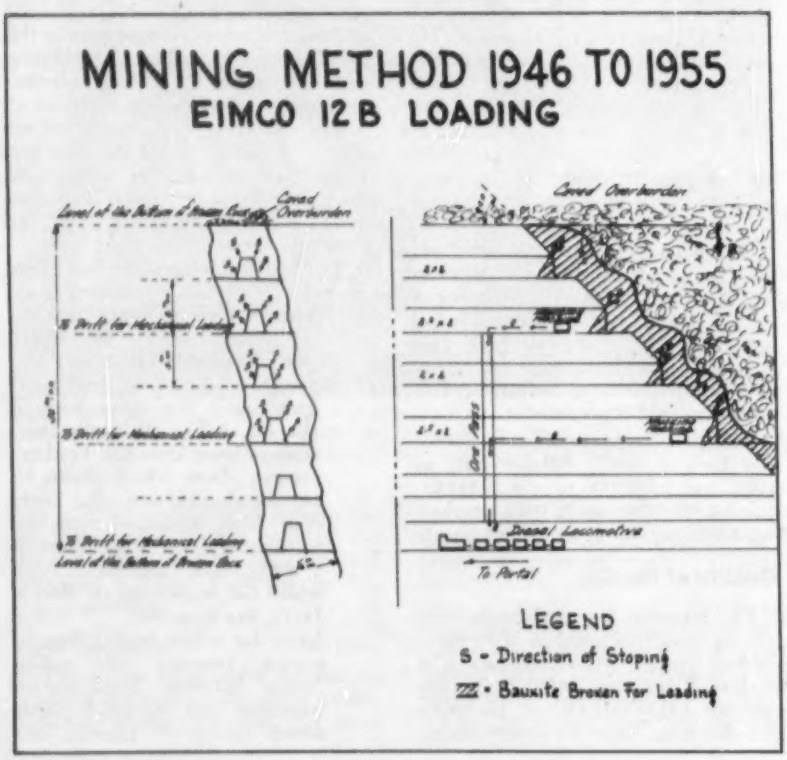
The bauxite deposits have been worked for a long time as lode deposits since the miner considers the presently non-commercial bauxite as a barren gangue. A small increase in acceptable silica content by users can give new value to very important non-commercial deposits.

Moreover, the characteristic industrial factor of the "red" bauxites is the value of the proportion of $\frac{SiO_2}{Al_2O_3}$ and not the solely SiO_2 content.

Geographical Location

Four provinces contain bauxite reserves which are being mined. They are, in the order of the importance of their 1955 production: Le Var: approximately 75 percent—red and white bauxites; Hérault: approximately 24 percent—red and white bauxites; and Ariège and Bouches du Rhône: approximately 1 percent—various bauxites.

Le Var contains the most important deposits. These are near Marseille, where the largest alumina factories are located. Hérault, where the ores are less uniform in grade and deposits less regular, is second in importance. The deposits in Ariège and Bouches du Rhône are mined very little today.



To estimate total reserves is a very difficult task, because prospecting for deposits in depth has just started. The geological certainty of a deposit never proves that the bauxite will be of commercial grade.

The figures most currently mentioned for the reserves of Bayer Process-type bauxite in 1955 were 60,000,000 tons, of which 35 percent were in Var.

The important reserves of the future will be from deeper underground deposits. Since 1948, there has been systematic drilling with Craelius and Joy diamond drills, and today's average drilling depth is from 100 to 250 meters. However, financing of these drilling programs, of which generally less than 30 percent are successful, poses financial problems of great complexity.

Aspects of the Beds

When the bauxite occurs in the form of beds, lenses, or pockets in the wall rock, it usually has the consistency of a soft limestone. It occurs most frequently in beds. These beds often have a more or less deformed synclinal structure, and usually outcrop on hill slopes. The enclosing altered limestone is always extremely irregular and embossed, while the back is generally limestone and rather regular.

Ore grade varies from one point to another in a rather sudden way, more often with a certain continuity for a short distance (which could be explained by the formation of the bauxite from decantation of primary mud). The zones of homogeneous ore are often localized in lenses of non geometrical outline in the favorable geological horizon. The limestone walls, generally cavernous, contain much water in depth.

Ore Pockets

Characteristically, in the deposits in the northern part of Le Var Province, erosion has exposed the top of ore bed. The lenses of ore, existing in the limestone wall bumps, have remained and today give the impression of isolated balls. These pockets either outcrop or are covered with more recent sediments.

Empirical Features

A certain number of empirical features may help the miner, although it should not be forgotten that they are the result of statistics which can never be considered as being too accurate:

The ore next to the back often contains less iron than the ore

nearer the wall, and is, by comparison, more silicious (consequently softer bauxite);

The wall pockets (north of the Var for example), are often only slightly silicious, but higher in iron (consequently harder bauxite);

Generally speaking, the white bauxite (with little iron) is at the top, often near the outcrops;

Ore grade changes completely when crossing faults.

Under today's conditions, a subterranean layer of "red" bauxite of less than 1.50 meters thickness is not worth mining.

Working Techniques

The first workings naturally were open pits without stripping to mine ore lenses of selected grade. A few underground mines existed prior to 1905 but these were only justified by the superior grade of their ore. Shot drill prospecting started in 1905.

Before 1930, one center produced regularly more than 50,000 tons per year; in 1955, six (two pits and four underground mines) produced more than 100,000 tons. Approximately 70 percent of the 1955 production came from underground mines, 30 from open pits. The mines producing quality alumina and having a capacity of less than 50,000 annual tons are disappearing.

Open Pit Operations

Ore lenses or layers near the surface first have all overburden stripped off. Equipment includes electric and Diesel shovels, Diesel trucks, compressed air drills, and electric or fuse detonators.

The ore faces have a maximum height of 15 meters. The ratio:

$$\frac{\text{thickness of the overburden}}{\text{thickness of the ore}}$$

seldom exceeds $\frac{2}{1}$

The most difficult problem is ore grading and selective mining. Sorting, which is necessary in all the sedimentary bauxite deposits, cannot be easily mechanized.

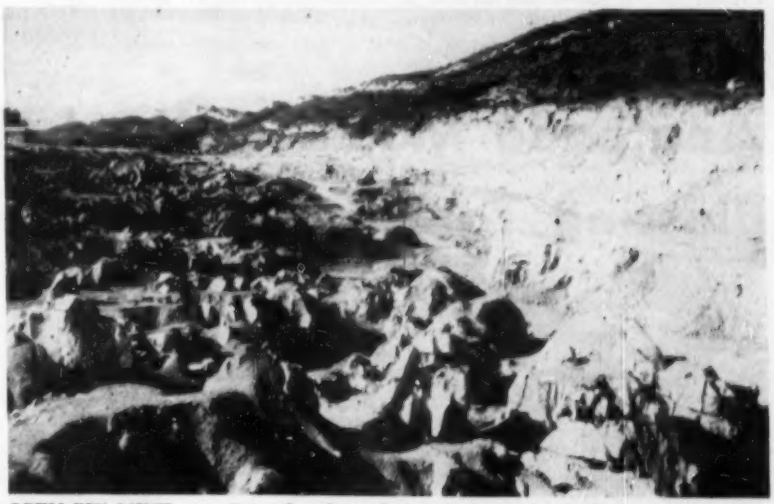
The loading faces are necessarily of small dimensions, because the non-commercial core must be isolated. Except in a very few cases, the clean up work by hand remains very important. The output is from six to 10 tons per man per day.

Underground Development

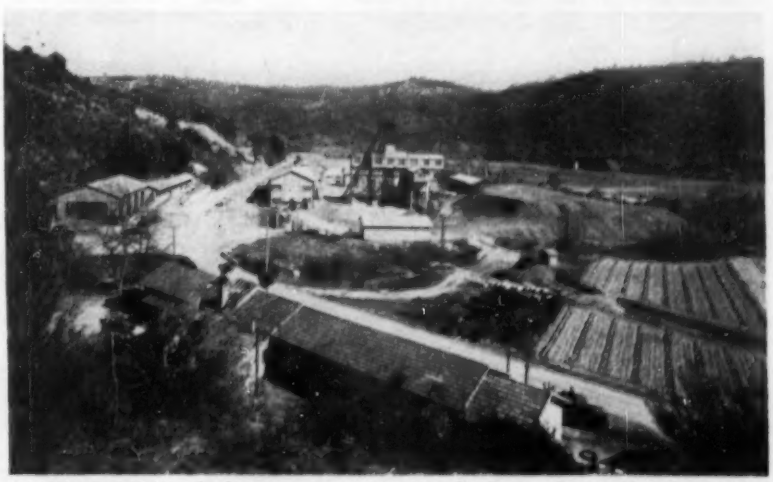
The underground mines are bound to be the future of the French bauxite workings. The first shafts, 50 to 100 meters deep, were sunk after 1930. The problem of pumping water then became important.

Continued on page 76 (WM 54)

MODERNIZED French bauxite mines enable four men to produce 80 to 100 tons per 8-hour shift by mechanized stoping. Shown above is the De Saint-Julien mine at La Celle near Brignoles; Societe des Bauxite de France.



OPEN PIT MINE near Brignoles shows limestone bedrock which hosts bauxite deposits in pockets and lenses. Note the remaining limestone nobs with mined-out portions between them. This mine is worked by Societe des Bauxites du Midi.



SURFACE PLANT of Cheneuprers mine, Societe d' Electro-Chemie d' Ugine, at Vins near Brignoles. Over 70 percent of 1955 French bauxite production came from underground mines.

DIESEL OIL is poured into the sack of prilled ammonium nitrate for mixing.

READY TO LOAD another blast at Weed Heights. Ammonium nitrate sacks are stacked at collar of each hole. Loading trough in foreground speeds loading.

Anaconda Modifies Weed Heights Pit Blasting To Save $5.19 Per Hole

Anaconda Company engineers have again succeeded in cutting blasting costs at the Yerington open-pit copper mine at Weed Heights, Nevada. The company's initial success with fertilizer-grade ammonium nitrate had been reported in MINING WORLD's August 1956 issue on page 56. Here are the newest modifications.

The average blast hole at Weed Heights in August was loaded as tabulated below:

Explosive	*Amount*	*Cost*
Special gelatin, 60 percent	25 pounds	$ 4.50
Ammonium nitrate, dynamite, 40 percent	50 pounds	7.50
Ammonium nitrate, fertilizer grade	125 pounds	5.69
	Total	$17.69

In early November the average blast hole was loaded according to the following tabulation:

Explosive	*Amount*	*Cost*
Special gelatin, 60 percent	25 pounds	$ 4.50
Ammonium nitrate, fertilizer grade	175 pounds	7.86
Diesel fuel	One Gallon	.14
	Total	$12.50

This newer method shows a saving of $5.19 for each blast hole loaded.

Weed Heights blasting practice still calls for shots of three rows of holes with both rows of holes spaced 20 to 25 feet apart. The drill holes, drilled by rotary drill using a 7⅞-inch bit are about 8 inches in diameter and are 30 feet

FIRST THE PRIMER, a 25-pound, six-inch cartridge of 60 percent special gelatin dynamite, is lowered to the bottom of the hole.

AMMONIUM NITRATE impregnated with Diesel fuel is poured into hole on top of primer. Powderman holds Primacord lead.

deep for the 25-foot-high benches. All holes are detonated by Primacord with millisecond delay connectors between rows.

The current practice at Weed Heights is to distribute the ammonium nitrate, fertilizer grade, at the collar of the blast holes preparatory to loading. These 80-pound, multiple wall, paper sacks containing the ammonium nitrate are opened, and from ¾ to one gallon of Diesel fuel is dumped in the sack on top of the ammonium nitrate. This Diesel fuel readily permeates the ammonium nitrate in the sack and no mixing is required. Since by experimentation the conclusion has been reached that ammonium nitrate with very little fines is more desirable than a product with a great deal of fines, prilled ammonium nitrate which is granular is used.

A 25-pound, six-inch cartridge of 60 percent special gelatin is lowered into the hole as a primer. The Primacord for detonating purposes is attached to this cartridge. The ammonium nitrate, impregnated with Diesel fuel, is then poured into the blast hole on top of the 60 percent special gelatin primer. While the Primacord is held above the surface of the ground by one of the powdermen, the rotary drill cuttings from the blast hole are shoveled in on top of the ammonium nitrate and the hole is stemmed to the surface with these cuttings.The hole is then ready to be attached to the Primacord trunk line for blasting.

This method of using ammonium nitrate, fertilizer grade, for the main charge in the blast holes has been used at Weed Heights for many months. Although each and every hole so loaded has detonated successfully, it is considered that this blasting method is still in the experimental stage and is subject to further improvement.

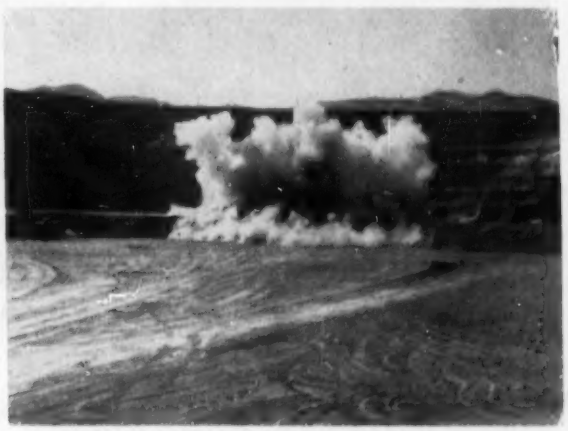
By further experimentation, for instance, the firm's engineers believe they will be able to determine definitely what is the proper amount of Diesel fuel to be used for each 80-pound sack of ammonium nitrate (currently, between ¾ gallon and one gallon of fuel is in use). They also believe that by additional trials this explosive might be applied to wet holes. Some treatment of the ammonium nitrate during manufacture might achieve this.

It is also considered possible that the amount of primer used in each blast hole (now a six-inch, 25-pound cartridge of 60 percent special gelatin) can be substantially reduced with proper detonation still secured.

Although the results have been very satisfactory, management believes that much can still be accomplished in this experimental blasting work, resulting not only in considerable saving, but also in broadening the application of this method of blasting.

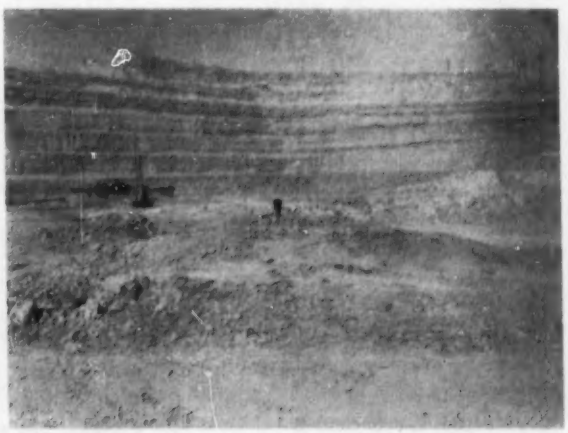
MINING WORLD extends its thanks to A. E. Millar, general manager at Weed Heights, for the information and photographs used in this article.

DRILL CUTTINGS are shoveled into hole for stemming. Primacord lead is attached to Primacord trunk line for blasting. Hole is stemmed to the collar



ANOTHER SUCCESSFUL BLAST. Fertilizer-grade ammonium nitrate has been used for many months at Weed Heights with perfect detonation.

DUST CLEARS showing another well broken muck pile. Shovel can move right in and begin truck loading in a few minutes.



HOLES BREAK right to collar with no big chunks in muck pile. This picture taken at same spot as first loading picture on page 54.

SIMPLOT'S NEWEST PHOSPHATE MINE, the Centennial, on Idaho-Montana border. Shovel is loading dark colored ore. Stripping of light colored overburden continues.

"Centennial"

A New Phosphate Mine By Simplot

Idaho has another important phosphate operation in the J. R. Simplot Company's Centennial mine located on the Idaho-Montana border 32 miles east of Monida, Montana.

Significantly this new mine was brought into production just 10 years after exploration started in the area and 10 years after initial ore shipments by the same company from Idaho's Gay mine on the Fort Hall Indian Reservation north of Pocatello. It was the same phosphate team—J. R. Simplot, company president, and George A. McHugh, manager of exploration and development—which found, explored, developed, and brought the two mines into production.

Exploration at the Centennial has developed 30,000,000 tons of acid-grade phosphate rock in 18° dipping beds of the Phosphoria formation of Permian age. Of this, 5,000,000 tons will be mined by open pitting before an adverse stripping ratio makes underground mining mandatory. The accompanying pictures show how the overburden is stripped with scrapers and hauled to waste dumps in the valley below the mine. Once the ore-bearing formation has been uncovered, it is broken loose with a tractor drawn ripper and then bulldozed down dip to a Diesel shovel for loading into trucks which haul it to the rail head at Monida. This railroad is scheduled to be extended to Lakeview, seven miles from the mine, where a crushing plant and loading facilities will be constructed. Ed. Pothier is Simplot mine manager.

Simplot exploration activities on the Phosphoria formations in Montana started in Alder Gulch in the fall of 1946. In 1947, the Melrose and Taylor creek areas were studied. In 1949, the western extremity of the Phosphoria formation was examined in Odell creek, where indications pointed to a non-commercial deposit.

Further exploration in 1950 was to the east in the vicinity of Taylor Creek on the Idaho side of the divide. Here the formations were more favorable and indicated a possible economic operation. A lease to the area was obtained from the United States government.

Exploration activity in 1953 included drilling, trenching, aerial photography, and detailed geologic mapping. Results indicated that exploration of the total Phosphoria deposit should be undertaken. This was accomplished in 1954 and 1955, which, together with preliminary road building, made it possible to open the mine for production in 1956.

PUSH LOADING scraper which hauls 20 cubic yards of overburden to waste dumps below the mine. Note ripper on Caterpillar to loosen overburden for easy loading.

FIRST PHOSPHATE ORE is bulldozed into a loading pile at the Centennial mine. Phosphoria beds showing stratification are visible just left of Caterpillar under thin overburden.

United States

Personalities in the News

WALLACE G. WOOLF, general manager of the Bunker Hill Company's mining, milling and reduction operations at Kellogg, Idaho, has been named vice president in charge of operations at Kellogg. A University of Utah School of Mines graduate, he joined Bunker Hill as a research metallurgist in 1918, became superintendent of the firm's electrolytic zinc plant when it was built in 1928, and later was named plant manager.

David R. Straub was elected vice president, general manager, and director of the White Pine Copper Company, a subsidiary of Copper Range Company, Boston. He was formerly associated with Western-Knapp Engineering Company of San Francisco.

E. R. Goter is the new general superintendent of the Kings Mountain plant of Foote Mineral Company, North Carolina. He was promoted from the positions of mine superintendent and assistant operations manager, and has been replaced as mine superintendent by **Ralph C. Flow**, formerly assistant mine superintendent. **T. J. Albrecht**, previously assistant mill superintendent, has become mill superintendent. **Robert W. Rosberg** has been promoted from metallurgist to assistant mill superintendent.

Frank H. Madison, for many years Chief of the Mining Section (Natural Resources) of the Internal Revenue Service and principal mining engineer in the United States Treasury Department, retired from government service in November. He has joined the firm of Behre Dolbear & Company, Inc., mining, geological, and metallurgical consultants in New York, as associate member.

C. O. Mittendorf, head of the national Defense Minerals Exploration Administration (DMEA), met with mining men in the Knoxville area of Tennessee early in November. It was Mr. Mittendorf's first visit to the area in 13 years, and he conferred there with **Robert Lawrence**, executive officer in charge of the Knoxville office, which is headquarters for the largest of DMEA's five regions and covers all of the eastern states.

OTTO HERRES, Salt Lake City, retired recently as vice president of Combined Metals Reduction Company to spend more time on his work for the mining industry. Mr. Herres is chairman of the National Lead and Zinc Committee and has long been a leader in the western mining industry's quest for trade and tariff relief. He was at one time a member of the National Minerals Advisory Council of the Interior Department, and was offered the appointment as director of the United States Bureau of Mines, but refused in order to continue his work to obtain legislation for the industry through the emergency lead and zinc committee.

Edward M. Laczynski, metallurgical engineer, has joined Michigan Chemical Corporation's research staff and will work on rare earths metals at the company's rare earths laboratories in Saint Louis, Michigan.

Carl Oswell is the new lead drill maintenance man at the American Smelting and Refining Company Silver Bell copper mine. For many years he was employed by the Kennecott Copper Corporation as pit churn driller.

D. H. Fenske has been named chief metallurgist of the Phosphate Minerals Division, International Minerals and Chemical Corporation in Bartow, Florida. He has been a member of the company's research division since 1948.

Robert L. Bennett has been appointed assistant manager of research for the Oliver Iron Mining Division of United States Steel Corporation.

Randal E. Smith has been promoted to refinery superintendent at Potash Company of America, Carlsbad, New Mexico. The position was formerly held by **A. J. Weinig, Jr.**, who resigned recently. Mr. Smith has been replaced as assistant refinery superintendent by **Eugene Dale**, formerly superintendent of the company's Dumas, Texas operation. **Thomas Donaldson** has taken over the duties vacated by Mr. Dale. Mr. Donaldson was previously production supervisor at Dumas.

N. E. McDougal, assistant resident manager of the Westvaco division of Food Machinery and Chemical Corporation, has been promoted to resident manager of the company's Trona mining operation near Green River, Wyoming. He succeeds **C. A. Romano**, resident manager of the plant since it was constructed in 1948. Mr. Romano has been transferred to the firm's corporate staff headquarters in San Jose, California. **J. R. Jacobucci**, staff assistant to the general manager, has been promoted to general superintendent.

Robert L. Wells, consulting mining geologist, and **Samuel F. Turner**, consulting water geologist, have formed the firm of Turner and Associates, qualified to undertake any type of geologic consultation. Their office is in Phoenix, Arizona.

Harry J. Wolf, mining and consulting engineer of New York, was in Arkansas recently to investigate the manganese resources of Polk County.

Members of a Congressional subcommittee of the House Education and Labor Committee recently toured mining operations of The Anaconda Company in Butte, Montana. The group, which visited underground at the Kelley mine and the Mountain Con mine, included **Representative Lee Metcalf**, (D—Montana) chairman of

ROGER W. STRAUS (left), chairman of the board of American Smelting and Refining Company, is shown accepting a "certificate of recognition" from J. C. KIEFFER, vice president of the Idaho Mining Association and Northwest general manager of ASARCO. The award was presented in behalf of Idaho Governor ROBERT E. SMYLIE for Mr. Straus' "wisdom and leadership in bringing the Galena mine into production, with resultant great benefits to the United States and to the Coeur d'Alene district of Idaho." Mr. Straus was responsible for a successful investment of more than $3,500,000 in search of deep silver-copper and lead-zinc ore bodies.

the subcommittee, **Rep. Orvin B. Fjare** (R—Montana), and **Rep. Carl Elliott** (D—Alabama). The subcommittee is seeking information about the possible need for federal legislation with respect to mine safety, and have conducted similar investigations and hearings in the Minnesota Iron Range area and in Colorado.

Hjalmer Anderson, formerly with Western Knapp Engineering Company, Hibbing, Minnesota, has assumed the position of chief mechanical engineer with Cleveland Cliffs Iron Company, Ishpeming, Michigan. He succeeds **R. G. Schaal** who resigned.

Three graduate students in metallurgy have won International Nickel Company, Inc. fellowships to Harvard University. They are **Joachim Jacques Hauser**, Paris, France; **C. Stratton Lindenmeyer** of Kirkwood, Missouri; and **James Myles Lommel**, Skokie, Illinois.

LLOYD S. CAMPBELL has been named assistant to the vice president of operations for United States Steel's Oliver Iron Mining Division in Duluth, Minnesota. He is currently assistant general superintendent of the company's Virginia-Eveleth district operations, and joined the Oliver organization in 1936 upon graduation from the Michigan College of Mining and Technology. JOHN CHISHOLM was promoted from his former position as assistant general superintendent of Oliver's Hibbing-Chisholm district to become general superintendent, Virginia-Eveleth district.

Here's ready-to-use stripping on International

FROM ALABAMA:

"Planet Power steering increases production—adds safety"

On this large coal-stripping operation near Peterson, Alabama, 20 to 40 feet of earth-sand-gravel, and blue shale overburden is removed—approximately 50% of it with crawler tractor power.

The International TD-24 moves an estimated 4,000 cu yd of earth-sand-gravel overburden per 10 hours, on the average 100-foot push.

"We are well pleased with our TD-24's," states A. S. Bowen, for Bowen Construction Company, Birmingham, with the authority of 7 years of TD-24 experience. "The TD-24 is the best cutting dozer we've ever used. The 2-speed (Planet Power) steering is a great advantage for rough terrain operation, which means increased production and added operator safety."

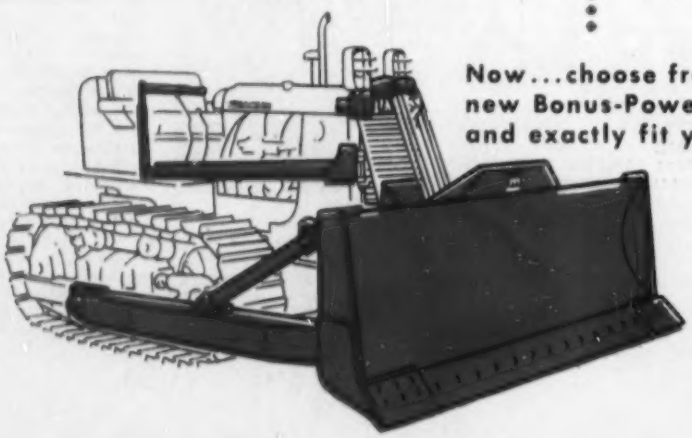
FROM WEST VIRGINIA:

"The TD-24 is built to take our hard work"

"We've owned seven International TD-24's since 1948," reports A & P Mining Company, Enterprise, West Virginia. "With this model, excessive track wear is a thing of the past. Our work is hard and the TD-24 is built to take it. We are well pleased because these machines are dependable, continuous producers."

One of the mining company's two TD-24's is shown operating under typical bituminous stripping conditions in the Jones Run area near Clarksburg.

Pushing cable tilt dozers, the crawlers are teamed with a 3-yard shovel to strip off an overburden of shale, limestone, and earth—averaging 70 feet. Operation is uncovering the 6 to 7-foot vein known as the Pittsburg seam, being mined for the electric utility market.

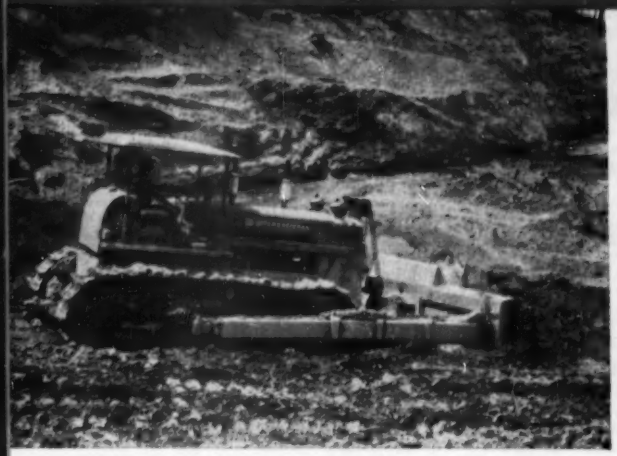


Now...choose from 42 new blades...to match your new Bonus-Powered International crawler and exactly fit your coal-stripping needs!

See for yourself how exclusive International TD-24 Planet Power steering eliminates the "load-limiting drag" of ordinary big crawler steering—gives you instant hi-lo power shift *under load*. Try such TD-24 job-speeding advantages as Cerametallic engine clutch operating ease and efficiency—and easy, on-the-go shifting. Measure how an International Drott 4-in-1 Skid-Shovel (1-yd. to 3-yd. capacity) can outproduce a machinery yard full of "one-purpose" machines. See your nearby International Construction Equipment Distributor for a demonstration!

experience from four states

TD-24 advantages



FROM KENTUCKY:

"Full-time live power on both TD-24 tracks ideal for highwalling"

"TD-24 Planet Power steering, giving full-time live power on both tracks, makes it an ideal highwall crawler. During our first 2,200 working hours on the TD-24 we had no downtime.

"Work capacity, operating ease, low upkeep, and dealer service are why we are using International crawlers," declares partner Maloy Mullins, of Mullins and Mullins Coal Co., Pikesville, Ky.

"Our TD-9 Drott Skid-Shovel loads out over 434 tons of coal in 7¼ hours—besides maintaining haul road and doing clean up. Takes only 15 minutes to change from bucket to angle blade."

Picture shows the Mullins' TD-24 stripping earth-shale overburden from the Elkhorn No. 2 seam.

FROM TENNESSEE:

"Still making a profit where others don't"

Sisco Brothers Mining Co., Mt. Pleasant, Tennessee, are uncovering phosphate rock deposits at a site once abandoned in 1931 because of high costs! Now they're making the venture pay, using International TD-24 capacity for large-scale overburden removal.

Says partner Earl Sisco: "We have been in the phosphate mining business for over 30 years and are making a profit reworking abandoned deposits where others find it hard to do. We have to move a tremendous yardage of overburden as cheaply as possible to 'come out' despite rising costs. First cost and dozing production of International TD-24's are most satisfactory."

The Siscos' TD-24's, working in parallel, average moving 16 cu. yd. per pass. The units operate the year round. This mining company loads out 500 tons of phosphate ore per 8-hour day!

INTERNATIONAL HARVESTER

INTERNATIONAL® Construction Equipment

International Harvester Company, 180 N. Michigan Avenue, Chicago 1, Illinois

A COMPLETE POWER PACKAGE INCLUDING: Crawler, Wheel, and Pipe-Beam Tractors . . . Self-Propelled Scrapers and Bottom-Dumps . . . Crawler and Rubber-Tired Loaders . . . Off-Highway Trucks . . . Diesel and Carbureted Engines . . . Motor Trucks

Newsmakers in International Mining

Dr. N. L. Nicholson is the new director of the Geographical Branch of Mines and Technical Surveys in Canada, replacing Dr. W. J. Watson, who resigned recently to teach at the University of Edinburgh. Dr. Nicholson joined the Branch in 1949 as head of the section on Canadian geography.

F. W. Goddard has been transferred to the Parral Unit in Chihuahua, Mexico, of the American Smelting & Refining Company, as mill superintendent. He was mill superintendent at the Charcas Unit for the past four years, and previous to that was at the company's flotation mills at Angangueo, Michoacan, and Chihuahua.

Gabor Dessau has returned from the Geological Congress in Mexico to his assignment as UNESCO expert with the Israel Institute of Technology in Haifa. He will stay in Haifa for another year, to establish a mining engineering department, and then return to his academic and consulting activities in Italy.

Dr. E. R. Gee has been named director of the Geological Survey of Pakistan. He once was employed by the Geological Survey of India in areas now included in Pakistan. More recently he has been geological consultant to several large oil companies in London.

F. J. L. Wells has been appointed manager of the Johannesburg Consolidated Investment Company, Ltd., Union of South Africa.

Six steel experts from the Tata Iron and Steel Company, Jamshedpur, India, are in the United States for a six-month study of steel production methods and plant maintenance at the Kaiser Steel Corporation plants. Their company owns India's largest steel plant which is now undergoing an expansion to almost double its ingot production to 2,000,000 tons annually. The total project will cost $130,000,000 and is being engineered and constructed by Kaiser Engineers. The visitors will work alongside plant personnel, but will not replace anyone. C. C. Tripathy and S. P. Arora will specialize in open hearth practices; N. K. Chakravarty, blast furnace practices; Sarbajit Singh, mechanical maintenance; V. K. G. Pillai, soaking pits and blooming mill operations; G. R. Nair, methods in the Structural mill and the Merchant-Skelp mill.

Victor Paz Estenssoro, former president of Bolivia, visited the Hitachi mine and Furukawa Denko's Nikko electrolytic plant during a trip to Japan in November. While he was in Tokyo, the Japan Mining Industry Association held a conference for him to discuss the possibility of technical assistance for Bolivia. Nihon Mining Company, Toyo Mining Company, Toho Zinc Mining Company, and Nomura Mining Company have sent experts to Bolivia in past months and also had representatives at the conference for Mr. Estenssoro to discuss the proposal of sending 15 engineers and geologists from Japanese mining companies soon. Mr. Estenssoro stopped for a day in San Francisco, California on his way to Japan.

MARCUS DIGRE has accepted the position of associate professor at the mineral dressing laboratory, Norges Tekniske Hogskole in Trondheim, Norway. He is an expert on taconite milling and was formerly associated with Sydvaranger Iron Ore Company in Kirkenes, Norway. He wrote an article on Sydvaranger milling for the October 1953 issue of Mining World.

Christopher Lethbridge, mining engineer, has recently been transferred to the staff of Uganda Development Corporation, in British East Africa. He formerly was employed by the Tororo Exploration Company, of which Uganda Development is a partner.

V. G. Ford is now at the Sinai Mining Company, Ltd., Cairo, Egypt, after his recent return from England.

O. Hedblad, general superintendent of the Garpenberg mine at Dala Finnhyttan, Sweden, and J. Hindrum, general superintendent of the Kristineberg mine, Kristineberg, Sweden, are in the United States studying, among other things, sandfilling and mining methods used for oxidized sulphide ores.

A. J. Brink has been appointed assistant consulting engineer to Anglo American Corporation of South Africa Limited, and has been succeeded as manager of Vaal Reefs Exploration and Mining Company, Ltd., by T. J. Brassell.

Dr. William E. Van Steenburgh is the new director general of scientific services of the Department of Mines and Technical Surveys, in Canada. He replaces Dr. George S. Hume who retired recently. Dr. Van Steenburgh has been associate director of the science service of the Department of Agriculture since 1947.

Dr. John P. Nielsen, metallurgy authority from New York University, is in the Soviet Union to lecture and attend a scientific conference. He will be the guest of the Soviet Academy of Sciences for one month, and will lecture at the Moscow Institute of Metallurgy. Dr. Nielsen is known for his theory on grain growth in metals and his research on titanium and X-ray diffraction, and was invited to visit Russia by Dr. A. M. Samarin, Soviet steel making authority. They met in New York during September when Dr. Samarin was attending a one-week special course on titanium metallurgy at the New York University College of Engineering.

F. Bice Mitchell, professor of ore dressing at Cambourne School of Mines in Cornwall, England, has been visiting the Transvaal, Africa, in a consulting capacity and returned home just recently.

Mr. Viktor Sosic, mining engineer, is now at the Trepča lead-zinc mine in Skopje, Yugoslavia.

R. N. Harle, manager of Mufulira Copper Mines Limited, Northern Rhodesia, will take over new duties in January as assistant consulting mining engineer of the following companies in the Rhodesian Selection Trust (R.S.T.) Group: Mufulira Copper Mines Limited, Roan Antelope Copper Mines Limited, Chibuluma Mines Limited, R.S.T. Services Limited, and R.S.T. Exploration Limited. Mr. Harle has been with Mufulira all but four of his 21 years in the mining industry. He is succeeded as manager by Charles A. O'Connell, who has been assistant manager for a year. Mr. O'Connell came to Mufulira in 1939 as a stoper and was successively shift-boss, technical assistant, mine captain, mine engineer, underground manager, assistant mine superintendent, and mine superintendent.

W. J. Wilson, chief engineer of Messina (Transvaal) Development Company, Ltd., has been appointed manager of the company's Mangula mine at Sinoia in Southern Rhodesia, where development of the copper deposit is in progress.

H. W. C. Prommel, consulting mining engineer, has recently returned from the jungle country between the mouth of the Orinoco River and the British Guiana border in Venezuela, South America, to investigate potential gold placer ground. He reached the area by traveling 600 miles in two days by car through the Eastern Oil field region of Venezuela, two days by canoe on the Orinoco River to the Boca Grande, and then 24 miles by foot through the tropical rain forests.

Ingvar Janelid, Swedish professor of mining technology, recently visited several mining companies and operations in northern United States and Canada.

R. H. S. Ewins has left Uruwira Minerals Ltd. at Mpanda, Tanganyika, Africa to become mill superintendent for Compania Minera Castano Viejo in San Juan, Argentina.

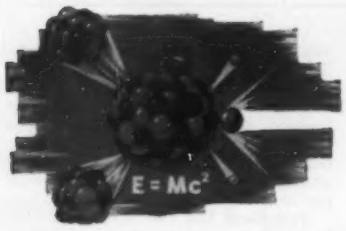
L. Larssen, manager of Rana Gruber S.A. iron mining firm of Oslo, Norway, visited mining operations in the Lake Superior region of the United States recently.

K. K. Nayar, deputy secretary of the Ministry of Commerce and Industry, India, has been appointed deputy general manager of the Bhilai steel project.

Clark Hodges, Allen Gillard, and James Crusen, members of the staff of Utah Construction Company, will serve in the construction program for the Southern Peru Mining Corporation.

Albert G. Bureau, mining engineer with headquarters in Paris, France, recently visited mines in the Mesabi Iron Range of Minnesota.

W. A. Coster has left Surinaamsche Bauxite My, Paramaribo, Suriname, South Africa to join the geological staff of the American Metal Company, Ltd., New York City.



FISSION FACTS

Monthly Roundup of Mining News In the Atomic Energy Field

Hecla To Adopt Longwalling at Radon Property With Telescopic Steel Props for Back Support

Longwall mining, using German-made steel props, will be introduced for the first time on the Colorado Plateau by Hecla Mining Company at the Radon property 25 miles southeast of Moab, Utah. This method is being adopted by Hecla in order to obtain maximum recovery of the uranium ore in the deposit while at the same time circumventing future difficulties which might arise from pillar recovery. These facts were reported by W. H. Love, manager of mines, Hecla Mining Company, at a local AIME meeting.

For some time room and pillar mining has been popular as an economical method of extracting ore from the flat lying, bedded deposits of the Plateau. However, this method is only capable of recovering anywhere from 30 to 65 percent of the ore before pillars are recovered. Pillar reclamation is now becoming a problem facing many operators, and complete or even partial recovery will probably prove both expensive and difficult to control.

Hecla, it will be remembered, is managing one of the deepest uranium mines in the United States and has one of the finest mine plants in the country. For details see April 1956 issue of MINING WORLD, page 48. Since little was known of ground conditions at depth, a flexible system of development was used which would lend itself to a variety of mining plans. The shaft was sunk near the center of the deposit at the down-dip extremity of the ore. Four strike drifts on 120-foot centers were driven to the boundaries along the strike length of the orebody.

With the longwall method employed by Hecla, the ore will be mined in slices across the full width of the deposit while retreating toward the centrally located shaft from the extremities of the deposit. The overlying mudstone which is incompetent will be allowed to cave as mining retreats. Temporary support will be provided by using German-made, telescopic steel props.

Present plans are to use three rows of the steel props, spaced on 4-foot centers, across the width of the ore. Each row would parallel the face, and as each 4-foot cut is taken from the face, the row of stulls nearest the face would be moved to a position 4 feet behind the first row. Mining would thus retreat step by step to the shaft. Ore from the slice taken at the face would be slushed to one of the drifts for haulage to the shaft. The size of the cut taken from the face can be adjusted upward or downward depending upon ground conditions.

The Radon orebody is roughly 2,200 feet long from north to south, from 300 to 700 feet wide, and ranges from two to eight feet in thickness. It contains an estimated 300,000 tons of ore averaging about 0.7 percent U_3O_8. Current production is at the rate of 250 to 300 tons per day. Output per underground shift is 9⅗ to 10 tons per day. Calculated on the basis of the entire crew, production is 6⅗ tons per man shift.

Mr. Love was superintendent of the Radon operation from the time Hecla took it over in early 1955 until last August when he was promoted to manager of mines. He directed the shaft-sinking and development to the full production stage, and was primarily responsible for the advance planning of the operation. Hecla operates the property under a profit-sharing agreement originally signed with U. & I. Uranium, Inc., of Kellogg, Idaho, and subsequently turned over to Federal Uranium Corporation. The property is now controlled by Radorock Resources, Inc., which is a 51 percent owned Federal subsidiary. Now directing the Radon operation for Hecla is Philip Lindstrom, superintendent of Utah operations.

British Reactors Used For Civilian Electricity

The world's first large-scale atomic power station for civilian use, Calder Hall, was put into operation recently at Sallafield, in northwest Cumberland, England. Built at a cost of $42,000,000 by the British government's Atomic Energy Authority, it is the first of more than a dozen nuclear power plants planned for England within the next ten years.

The plant is equipped with two reactors, each driving two turbines with a capacity of 23,000 kilowatts each. The reactors are each fired by 120 tons of uranium in rods in 200-foot "piles" of graphite blocks. By the end of 1956 Calder Hall will have a top capacity of 92,000 kilowatts.

Power generated at Calder Hall will also be used to produce plutonium, as well as for running the cotton mills of Lancashire and the mines and factories throughout industrial northwest Britain.

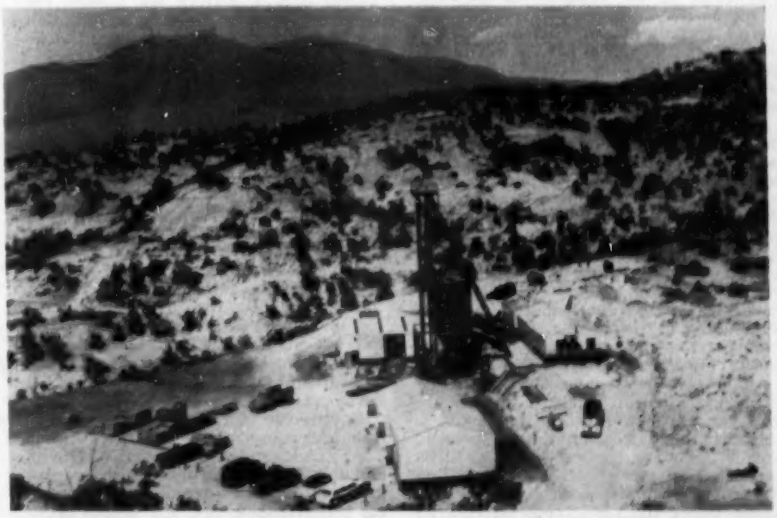
British experts predict that, by 1965, nuclear power plants will produce 6,000,000 kilowatts of electricity of a total United Kingdom capacity between 35,000,000 and 40,000,000 kilowatts. England has a current capacity of about 20,000,000 kilowatts.

First Commercial U-235 Produced By Mallinckrodt

Enriched uranium for use in generating commercial electrical power is now being produced, for the first time in the world by private industry, at the new Mallinckrodt Chemical Works plant in Hematite, Missouri.

Uranium dioxide enriched in the isotope U-235 is being manufactured to meet individual customer specifications. It is shipped to their plants where it is fabricated for use in the center or core of atomic reactors to produce heat which leads to generation of electricity.

The Hematite plant is producing two grades of uranium dioxide. One is the ceramic grade designed for use in pellet form, and the other is sintered for use in "matrix" or "ceramet" fuel elements. Uranium trioxide and other compounds can be manufactured if the demand arises. The processes were developed in a pilot plant at Mallinckrodt's main plant in St. Louis.



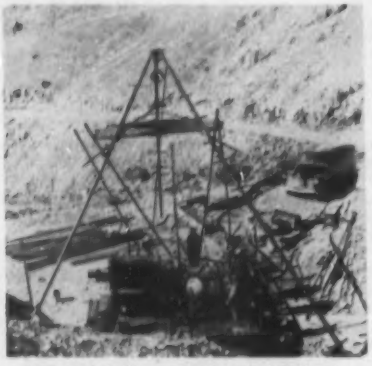
Well engineered surface plant of the Radon property was built by Hecla in 1955.

Andes Copper Expands Plans for Development Of Chile Mine Because of Increased Reserves

Andes Copper Mining Company, a subsidiary of the Anaconda Company, has enlarged the proposed plan for mining the El Salvador ore body and speeded up the project so that full production at an annual rate of 100,000 tons of copper will be reached in 1959.

The El Salvador mine is near Indio Muerto Mountain, 18 miles north of Andes' Potrerillos, Chile mine, flotation mill, and smelter. With the Potreillos ore body scheduled for depletion in four or five years, the first plan was for El Salvador ore to be treated in Potrerillos plants.

Development of El Salvador has been so successful since March that the new plan was warranted by increased ore reserves which make El Salvador one of the world's largest copper deposits in point of contained copper. The original estimate of 78,000,000 tons averaging 1.6 percent copper, based on drilling to March, already has been increased to approximately 200,000,000 tons averaging 1.6 percent copper by additional drilling completed since that date. Prospect drilling is still continuing under conditions favorable to the development of more ore.



Diamond drill prospecting at El Salvador

Formal presentation of its new plan was made by the company to Osvaldo Sainte Marie, Chilean Minister of Mines. Under the provisions of Chile's new copper law, the plan if approved will result in investment of a total of $80,150,000, an increase of $27,200,000 over the total investment planned initially.

Andes Copper has concluded that its original plans for bringing the mine into production should be adjusted to the larger ore reserve tonnages, and that the new design should be more flexible than the original. The company's new plans provide for even further expansion when conditions warrant. Latest plans call for a crushing plant and concentrator to be built at the mine site. The revised concept also provides for a larger townsite to be built at El Salvador. Concentrates will be transported thru a 15-mile pipeline to the Potrerillos Railway at Pastos Cerrados where the concentrate will be filtered, loaded on railroad cars, and transported to Potrerillos for smelting.

Under the new plan, the company's cost of producing copper will be greatly reduced from present costs and will be even lower than the estimated cost per pound under the plans outlined earlier this year.

The total cost of this revised plan is estimated to be $80,150,000, of which $33,855,000 would be spent in Chile and $46,295,000 spent outside of Chile for machinery and supplies.

Australia Reappraises Black Sand Reserves

A survey by the Australian Bureau of Mineral Resources indicates that production of rutile, zircon, and ilmenite from sands on the east coast of Australia (northern New South Wales and southern Queensland) could be extended for up to 20 years from high-grade deposits alone. Immense deposits of low-grade sands undoubtedly occur also on the east coast of the continent. It is now apparent that previous "reserve" figures were greatly underestimated because until the recent intense interest in these minerals, insufficient work had been done to permit a proper assessment.

In Queensland, the Minister for Mines forecasts a considerable expansion during the current year beyond last years figure of 35,600 tons of rutile valued at over £1,154,000. Total Queensland-New South Wales output this year is expected to reach 80,000 tons and projects in hand may raise this to 120,000 tons by the end of next year. Although demand is still very strong, there are signs of a pause as potential buyers hold off to see the effect of increased production on the market. Most producers believe that all rutile that can be produced will be sold although somewhat lower prices than recent record bids are expected for spot deliveries. Large tonnages are already sold forward from two to five years at guaranteed prices which are well above expectations of a year ago. Demand for zircon has increased and price has risen by about 50 percent in recent months. It is estimated that output will exceed 50,000 tons this year and may reach 55,000 tons.

Australian ports are now shipping rutile all over the world. Of 60,000 tons exported in 1955, 21,000 tons went to the U.S.A., 12,000 tons to Great Britain, and 26,000 tons to Europe and Japan. The Oerlikon Machine Tools Works, of Zurich, has set up its own buying agency in Australia to obtain its requirements.

Swaziland Invites Expert To Study Mining Problems

Swaziland, the British Protectorate which is almost completely surrounded by the Union of South Africa, has great mineral potentialities, as evidenced by the 1955 production valued at £2,355,-909. Little has been done in the way of systematic exploration, chiefly because of transportation difficulties. To study this problem, the Swaziland government has invited Sir Arthur Griffin, expert in rail construction and administration, to examine the country's communications with a view to drawing up a program of development.

Encouraged by this prospect, the Anglo American Corporation of South Africa, The Rhodesian Selection Trust Group, and Rio Tinto Company of London plan to conduct a joint exploration program on the understanding that any serious opening-up of the territory will depend on the steps taken by the Swaziland government following Sir Arthur's report.

Iron ore and coal are the chief mineral resources. The country possesses an estimated 300,000,000 tons of low-grade iron ore, ranging between 20 and 40 percent iron, and 60,000,000 tons of higher grade material averaging more than 60 per cent iron.

Swaziland has the well-known Havelock asbestos mine which is being developed by the British company, Turner Newall Ltd. Transportation difficulties have been overcome there by construction of a cableway from the mountain deposit to Barberton in the Eastern Transvaal.

Promising alluvial gold deposits have been found along the ancient riverbeds of the Black Umbelosi and Komati Rivers, but interested companies have encountered the problem of water pollution caused by hydraulic mining methods. Riparian rights of natives in settlements along the lower reaches of these rivers assure British protection.

Pickands Mather Leases Labrador Iron Property

A lease agreement for a large body of iron ore in west-central Labrador, guaranteed to yield at least 200,000,000 tons of concentrates through open pit mining, has been obtained by Pickands Mather & Co., Cleveland, Ohio, in conjunction with The Steel Company of Canada, Limited, from Canadian Javelin Limited, of Montreal.

Pickands has agreed to buy up to 2,000,000 tons of the pellets per year, from 1959 through 1964, and the Steel Company of Canada will also buy concentrates from Canadian Javelin.

The lease covers part of the five square mile "Wabush Lake" property which is about 200 miles north of Seven Islands.

The ore is a low grade, coarse-grained material which, present tests indicate, can be concentrated to high grade iron ore. No date has been set for beginning of operations at the property.

African Company Formed To Revive Kyanite Mines

The rich kyanite deposits at Murka Hill in the Tsavo Game Park, Kenya, South Africa, are being taken over by New Consolidated Gold Fields Ltd., from Kenya Kyanite Ltd. who was unable to make them pay because of processing difficulties. G.F.K. Rerfactories Ltd. has been formed in London by New Consolidated to develop the property and commercial production is expected within 12 months.

The Murka Hill kyanite occurs in schist, which has to be separated out by some form of flotation. Kenya Kyanite was unable to solve this problem, whereas New Consolidated officials believe that the company, with its extensive technical and capital resources, will be able to save this potentially valuable industry from being abandoned.

After several months of drilling and testing, New Consolidated offered £150,-000 for the mining assets of Kenya Kyanite.

A new East African representative, D. J. Rogers, has been appointed by New Consolidated. Until recently in private practice as a mining engineer in South Africa, Mr. Rogers at one time repre-

sented another large mining house in East Africa and for the past five years has been closely associated with the Colonial Development Corporation's mining activities in East Africa.

Aluminum Output To Rise At Japanese Refinery

A $7,000,000 expansion program will begin soon for the Showa Denko Company, one of Japan's three producers of primary aluminum. Proposed installation of a new electrolytic cell at the Kitakata refinery will increase production by 50 percent, to 30,000 tons annually. The new unit is expected to turn out 5,000 tons of primary aluminum next year and 10,000 tons a year by 1958.

The Kitakata refinery is producing 11,000 tons of the company's present 20,000-ton output. The remainder comes from the refinery at Ohmachi, Japan.

Four of the company's technical experts visited European plants before expansion program plans were finalized. Further details will be released soon.

Gold Claims Case Awaits Supreme Court Decision

The federal government has taken the last legal measure open to it in attempting to avoid payment of damages to gold producers under World War II WPB Order L-208. On October 24th the Justice Department asked the Supreme Court to review the Court of Claims ruling of February 26th whereby producers were entitled to just compensation under the Fifth Amendment to the Constitution. Again on July 12th the Court of Claims denied a Department of Justice request for a new trial in upholding its earlier decision.

In making the appeal to the Supreme Court, the Justice Department said that over 160 damage cases are pending before the Court of Claims and that payments, if and when made, would total between $30,000,000 and $60,000,000. In the May issue of MINING WORLD, page 57, a special report on the gold claims said that 189 claims totaling $120,955,190 had been filed.

New Buffelsfontein Plant To Recover S. Africa U_3O_8

With 29 mines designated as uranium producers, the contract for sale of uranium oxide by the South African Atomic Energy Board to the Combined Development Agency has been filled.

The original contract was estimated at £30,000,000 a year, but has been extended to about £50,000,000 a year. Since this extension, a 30th South African mine, Buffelsfontein Gold Mining Company, Ltd., has been accepted as a uranium producer. The company is erecting a £3,411,000 plant, east of Klerksdorp, with a 100,000 ton-per-month capacity for the treatment of gold residue slimes. Buffelsfontein has also applied for permission to construct a pyrite recovery and sulphuric acid plant, each with an output capacity of 100 tons a day.

Trial milling at the gold plant will begin toward the end of December 1956. Drilling results over the lease area indicates average grades on the Vaal Reef horizon ranging from about 280 to 400 inch-dwts.

India Plans Expansion Of Aluminum Production

India plans to expand her aluminum production from a current annual rate of 7,500 tons to 40,000 tons. Three new smelting plants will be erected, an existing plant will double its capacity, and bauxite output will be increased.

The state-controlled National Industrial Development Board is arranging for two of the smelting plants. One will be located at Mettur in Madras State, and the other in the Rihand power project area of Uttar Pradesh state. Both will cost between 100,000,000 and 120,000,000 rupees. One will go into productiong during the second Five-Year Plan (1956-1961) and the other will probably be completed in 1962. It is expected that one of the plants will be operated by the NIDB, but the other may be a privately owned project.

The Government of India has also given approval to the Indian Aluminum Company of Calcutta for erection of a 10,000-ton-per-year smelter at Hirakud in Orissa State, in collaboration with the Aluminium Laboratories of Montreal, Canada. This unit should go into production in 1957. In addition, the Jaykaynagar plant in Uttar Pradesh which produces 2,500 tons per year now plans to double its capacity.

To provide the needed raw materials, India's bauxite output will be raised from 75,000 tons to 175,000 tons under the Five-Year Plan.

Foreign Minerals Wanted For Agricultural Barters

The Commodity Credit Corporation which barters surplus agricultural commodities for foreign ores and concentrates has been currently authorized to barter for the following foreign minerals: Antimony; asbestos (amosite and chrysotile); bauxite (Jamaica, Surinam, and refractory); chromite, metallurgical (from Turkey for wool) and chromite, (refractory); cobalt (metal); graphite (Ceylon); lead; magnesium; manganese (battery type, synthetic dioxide, chemical-type B); manganese metallurgical, including ferro-manganese and electrolytic); mica (Muscovite block, film and splittings, and phlogopite splittings); silicon carbide (crude); talc (steatite block); titanium; and zinc.

On June 30, 1956 the CCC was holding in its supplemental strategic stockpile the following minerals (listed with their values):

Antimony metal, $1,035,922; cadmium, $4,370,635; diamonds, industrial, $26,297,850; ferrochromium-silicon, $3,922,932; ferromanganese, $33,044,354; fluorspar, $3,576,638; manganese ore, (military, battery grade), $171,269; palladium, $3,104,952; and rare earths, $462,611.

Mexican Mining Taxes Worry Industry Officials

Mining officials are said to be concerned about the considerable declines in production of certain commodities during the first half of 1956 from levels in the same period of 1955. Many believe that too many and too high taxes are to blame—there are still 19 different levies against the mining industry.

Silver production dropped so much during the first half of 1956 that these same sources express fear that Mexico will lose the first place position in world silver production that she has so long held. These sources, reportedly quoting official preliminary figures, say that silver output during the first six months of 1956 decreased to 562,458 kilograms from the 734,972 kilograms mined in the first half of 1955. Only 4,586 kilograms of gold were mined in Mexico from January to June of this year, compared with 5,919 kilograms produced during that period of last year.

These are among the taxes now in force on mining: on mining tracts; on production; supplementary on gold; 10 percent additional on the first two levies; export, specific and ad valorem; an additional quota of 25 percent on the ad valorem; two percent additional on export taxes; four separate income taxes; general imports; three percent additional on import imposts; five percent on metal treatment plants; predial levy; fiscal stamp; social insurance; a levy for the maintenance of schools for employees' children; and mercantile income.

The Ministry of Finance has now announced a 50 percent reduction in the tax on placer gold production which is handled in treatment plants of low capacity. The reduction applies to such gold that is acquired by the Bank of Mexico.

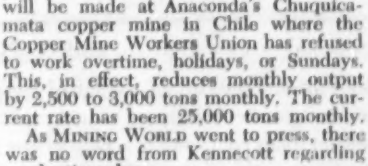
Cut in Output Follows Copper Price Reduction

The big three in the United States copper industry cut the price of copper by four cents to a new base of 36 cents per pound, late in October. Phelps Dodge Corporation, second largest domestic producer, took the lead in the price reduction on October 25, and Kennecott Copper Corporation and The Anaconda Company announced similar reductions shortly afterward.

Following on the heels of the price cut, Phelps Dodge announced that output of copper from its properties will be reduced by 7½ percent by shortening the work week at mines and mills. This cutback will affect the open pits at Morenci, Ajo, and Bisbee, as well as the underground mining program at Bisbee, Arizona.

The Anaconda Company later announced that domestic production of copper from its properties will be cut by 16 percent by reducing the work week. It is estimated that the Anaconda cutback will amount to 1,800 to 2,000 tons of copper per month. Another 10 percent reduction will be made at Anaconda's Chuquicamata copper mine in Chile where the Copper Mine Workers Union has refused to work overtime, holidays, or Sundays. This, in effect, reduces monthly output by 2,500 to 3,000 tons monthly. The current rate has been 25,000 tons monthly.

As MINING WORLD went to press, there was no word from Kennecott regarding production plans.



NORWAY—About 930,000 tons of iron ore concentrate were shipped from the

Sydvaranger mines in Kirkenes, north Norway during the first nine months of 1956. Total production for the year is expected to be well over the predicted 1,000,000 tons (MINING WORLD, March 1956, page 65).

FRANCE—A rich deposit of scheelite has been discovered at the Costabone Peak in the Pyrenees, near Amélies-les-Bains, by the French government-sponsored *Bureau de Recherches Minières*. The deposit is said to be large enough to almost meet the French tungsten requirements. Over 1,500 metric tons of test drilling cores have been made and work is continuing. It is believed that the deposit extends into Spanish territory.

EIRE—*Saint Patrick's Copper Mines Ltd.* in Avoca, County Wicklow, has driven over 1,600 feet in the process of completing a 7,000-foot tunnel, to open up the copper ore bodies for production. Saint Patrick's is a subsidiary of *Mogul Mining Corporation* of Toronto, Canada. About 250 men are now working in the mine, which is expected to go into production by the end of 1957. A concentrator is also being constructed on the property. The company has spent over £500,000 and will spend a further £1,750,000 to bring the mine into production. Plans are underway to ship the ore through the nearby port of Arklow for smelting on the continent, where all copper ore from recently re-opened mines will have to be smelted. The Irish minister for industry and commerce, Mr. Norton, has announced that, if the current exploratory work results in large producing mines, efforts will be made to establish a smelter in the country.

SWEDEN—Rich ore deposits have been discovered at the *Kalimora* mines at Norberg, and an entirely new plant has been built on the property. These mines were considered exhausted 10 years ago.

SPAIN—*Lithium Corporation of America* has been given special permission by the Spanish Ministry of Industry to maintain a 40 percent participation in exploration of the lithium ore reserves belonging to *Titania S.A.* The deposits are in Lalin, near Pontevedra, and will be worked by a subsidiary of Lithium Corporation and Titania.

AUSTRIA—Bauxite production for the first half of 1956 was 8,184 tons, a decline of 2.5 percent from the same period last year. The low output this year was due to production difficulties during the bad weather of February and March. Over half of the output goes to the iron and steel works, and cement and abrasive producers. The rest is sent to West Germany for processing into alumina. Copper ore output was also down during the first half with 73,000 tons for this year compared with 82,600 tons for January-June of 1955. The decrease is said to be chiefly due to a shortage of skilled labor. Antimony production during the first half of 1956 was 4,639 tons compared to last year's 5,198 tons for that period. The average content is 4.6 antimony.

CORNWALL—*Pena Copper Mines Ltd.* has acquired a wolframite mine which will soon be in production. Pena will receive 94 percent of the ordinary share capital of *Tungsten Manufacturing Ltd.* through an exchange on contracts.

PORTUGAL—*Beralt Tin & Wolfram Ltd.* has purchased tin property 27 miles from Panasqueira and will begin prospecting and development work soon. The company recently completed drilling operations for tungsten in areas of Angola, but found nothing suitable for development. During the year ending March 31, 1956, about 1,997 tons of tungsten concentrates were produced by Beralt.

EIRE—During the first half of 1956, *Silvermines Lead & Zinc Company Ltd.* milled 19,517 tons at *Shallee*, yielding 419 long tons of 68.8 percent lead concentrate with 34 ounces silver per ton. Ore handling equipment at the King's shaft has been installed and the main level advanced 87 feet, while development amounting to 363 feet has been driven. Diamond drilling is still underway to determine depth of deposits at Shallee (MINING WORLD, November 1956, page 83).

FRANCE—French iron ore production for August 1956 was 4,016,800 tons, compared to 4,184,900 tons in July and a monthly average of 4,193,400 last year.

NORWAY—*Skorovas Gruber*, owned by *Elektrokemisk A/S*, shipped 85,000 tons of pyrite during the first half of 1956.

AUSTRIA—Iron ore output at *Osterreichische Alpine Montangesellscaft*, in the province of Styria, reached 1,325,190 tons for the first six months of 1956, which is 10.2 percent higher than the same period of 1955. The increase is mainly due to a third heavy media separation plant which went into operation in 1956.

INTERNATIONAL

MALAYA—*Camp Bird Ltd.*, a British mining and finance group, has asked shareholders of 18 Malayan mining companies to exchange their stocks for shares in Camp Bird. Consolidation of these tin mining firms would form one more large mining group bringing to five the number of groups controlling European-operated mines in the Federation. The following companies have been offered the merger plan: *Chenderiang Tin Dredging, Ltd.; Gopeng Consolidated, Ltd.; Hongkong Tin, Ltd.; Ipoh Tin Dredging, Ltd.; Kent (F.M.S.) Tin Dredging, Ltd.; Killinghall Tin, Ltd.; Kinta Kellas Tin Dredging Co., Ltd.; The Kinta Tin Mines, Ltd.; Malaysiam Tin, Ltd.; Meru Tin, Ltd.; Pengkalen, Ltd.; Rambutan, Ltd.; The Renong Tin Dredging Co., Ltd.; Selayang Tin Dredging Ltd.; Sungei Kinta Tin Dredging, Ltd.; Tanjong Tin Dredging, Ltd.; Tekka, Ltd.; Temoh Tin Dredging, Ltd.*

JAPAN — The government's *Atomic Fuel Corporation* started uranium mining by undertaking drilling operations at the *Miyoshi* mine in Kurashiki, Okayama prefecture. Previous drilling had indicated sufficient uranium. The plan now is to drill 50 meters deep and to make surveys of the vein structure in connection with surface prospecting. If the survey is successful, a shaft will be sunk.

TURKEY—In the vicinity of Derince, near Ismit, veins of lead, zinc, and copper have been found in an old mining district.

MALAYA — *Idris Hydraulic Tin Ltd.* has been offered £160,000 by the French owned *Societe des Etains de Kinta* for purchase of the *Kranji Section* of Idris's mining area.

PAKISTAN—Pakistan is considering purchase of 60,000 tons of iron and steel from Austria. The country's total requirements are about six lakh tons yearly, while home production annually does not exceed 10,000 tons.

JAPAN—*Sumitomo Metal Mining Company Ltd.*, one of the major nickel smelting companies, has set up two subsidiary firms—*Hyuga Smelting Company Ltd.* at Hyuga, Kyushu, and *Toyama Smelting Company, Ltd.* at Toyama, Ishikawa-ken. These smelting firms are constructing new facilities which will produce ferronickel from nickel ore to be imported from New Caledonia. Hyuga smelter will treat 30,000 tons of nickel ore annually to recover 1,870 tons of ferronickel, and will go into operation shortly. Toyama will treat 35,000 tons of ore to recover 2,170 tons of ferronickel and will go into operation in April 1957. Together with the 250 tons per month in *Niihama* nickel plant, Sumitomo will produce 4,460 tons annually.

THAILAND—The board of directors of *Talerng Tin Dredging Ltd.* has approved a resolution for the sale of the company's mining leases to *Tongkah Harbour Tin Dredging* for 120,000 shares. The Talerng property is adjacent and contiguous to the company's mining property at *Ronpibon* in southern Thailand. Tests have confirmed that the property could be economically dredged by Tongkah's Ronpibon dredge without further modification.

One of the many drill rigs now in operation throughout the United States and overseas.

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INTERNATIONAL

MALAYA—*Petaling Tin Ltd.* will purchase approximately 176 acres of tin-bearing land from *Pilmoor Rubber Company Ltd.* for 2,000 Malayan dollars per acre. After completion of the purchase, Pilmoor will continue to tap rubber on a profit-sharing basis with Petaling until the latter is ready to proceed with mining operations. The area adjoins to the northeast that portion of *Seaport Estate* in which the No. 5 dredge is now operating. Prospecting operations reportedly have proved 5,195,000 cubic yards in this area, with an estimated recoverable tin content of 863 tons. This yardage should provide an additional life of 18 months for the No. 5 dredge.

JAPAN—*Mitsubishi Metal Mining Company* plans to enlarge its *Naoshima* smelting capacity and to install a new smelting method in the plant in order to keep pace with the expansion of the Toledo mill of *Atlas Consolidated Mining and Development Company*. Mitsubishi has a contract with Atlas to purchase concentrate from the Atlas operation in the Philippine Islands.

KOREA—Several gold mines are benefitting from loans granted by the *United Nations Korean Reconstruction Agency (UNKRA)*. Re-equipped with modern machinery, the *Songchun* mine is expected to produce between 20 and 50 metric tons of ore per day; the *Palkong* mine is expected to increase its output from its present 33 metric tons per month to a possible 100 metric tons per month. The *Kumchai* mine on the island of Namhae off the south coast of the Korean Peninsula is virtually a new enterprise. It was first discovered in 1941, but operations were stopped less than a year later because of Japanese war regulations. Insufficient development work later only produced about 70 metric tons over a six-month period. UNKRA engineers plan to install a new haulage system, air compressors, rock drills, and a jaw crusher to make this a productive proposition now.

IRAN—A new joint company has been formed by the *Iranian State Planning Organization* and the *Societe Miniere et Metallurgique de Penarroya* to develop lead mines in the northern part of Iran near Lakhan. Initial capital is £400,000 which may be increased later if needed.

GOA—In 1955 1,522,752 tons of iron ore were exported from Goa. Of this amount, 1,020,091 tons were sent to Europe and the remainder went to Japan. Exports of manganese were made to the United States totalling 4,498 tons. Total manganese exports during the year, however, totalled 163,392 tons.

TURKEY—The Mining Department of the Technical University will confer degrees in Mining Engineering in June 1957 for the first time. The Mining Engineering Department was established four years ago, and formal study for five years is required for the degrees. Branches of mining engineering, metallurgical engineering, and geological engineering are planned for the future.

PAKISTAN—The Atomic Energy Commission has approved in principle the construction of an advanced research reactor in West Pakistan and a powered reactor in East Pakistan. It is planned to build the research reactor within the next two years, and the powered reactor shortly thereafter.

INDIA—In keeping with underlying principles of the Second Five-Year Plan.

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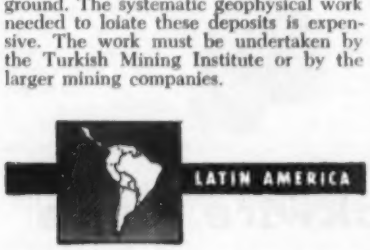
an extensive program of prospecting and development has been prepared and is already well underway. This expansion program is aimed at increasing the present output of the company's mines but no immediate results can be anticipated. During the past year development work in depth has been done in the *Mosaboni* mine using the newly constructed circular shaft. This work, on the scale currently planned, will permit extensive lateral development but only to the extent that it will counteract the decreasing reserves of the adjoining *Badia* mine whose life is limited. Any real expansion in output must come from other areas, and it is with this in mind that prospecting is in progress on an extensive scale to the north of the present workings.

MALAYA—*Tongkah Harbour Tin Dredging Ltd.* has agreed to purchase the properties owned by *Talerng Tin Dredging Ltd.* The payment will be in the form of a stock allotment amounting to 120,000 shares of 5s each. Latest reports from Talerng show that the company doubled its net profit during the year ended April 30, 1956 (£8,131 compared with £4,497 for the previous year.)

TURKEY—Although Turkey continues to hold its high rate of chrome ore production, it is necessary to look for new deposits, especially in the eastern part of the country. No prospecting has been undertaken on a scientific scale because of bad transportation facilities; roads and harbors on the Black Sea Coast are not too adequate. In the well known chrome districts only the deposits outcropping on the surface have been worked so it is likely that other deposits exist underground. The systematic geophysical work needed to loiate these deposits is expensive. The work must be undertaken by the Turkish Mining Institute or by the larger mining companies.



MEXICO—Wadie Scoor of Chihuahua has granted an option to *International Hermes* of Mexico City to investigate, explore, and develop a group of mines located at Pericernales, about six miles from the town of Cuauthmoc and about 60 miles southwest of the city of Chihuahua. Some samples taken by International Hermes reportedly assayed 0.3 to 0.9 percent mercury. Intensive exploration work has been completed, and installation of a 50-ton furnace is underway.

PERU—*Incanadium S.A.* is preparing to develop a 4,000-hectarea concession in Huamanin, Provincia de Huari, Department of Ancash. The company reportedly would mine asphaltite layers containing vanadium pentoxide. A 30-ton-per-day pilot plant is under construction.

BRAZIL—Geologists of the United States Geological Survey, working in cooperation with the National Department of Mineral Production in Brazil under the auspices of the International Cooperation Administration, have reported a large body of zinc and copper mineralization near the small village of Vazante in the northwestern part of the state of Minas Gerais. The deposit is in branching, subparallel fault breccia zones. Calamine and willemite, along with small quantities of smithsonite, form the matrix of the fault breccia. The zinc mineralization is cut by narrow veins of chalcocite in platy crystal aggregate thought to be pseudomorphous after covellite. The chalcocite veins contain small quantities of sphalerite, galena, covellite, and calamine. Copies of the report and maps are in open file at various points in the United States and at the office of the Departamento Nacional da Producao Mineral in Rio de Janiero. Dr. Avelino Ignacio de Oliveira, director of the Departamento Nacional da Producao Mineral, says the actual discovery was made by a Brazilian engineer, Luciano Jacques de Moraes, who studied the region and registered the area with the Departamento Nacional da Producao Mineral.

SURINAM—*N.V. Billiton Maatschappij* will ship about 740,000 tons of bauxite yearly to the newly formed *Olin Revere Metals Corporation* through its new subsidiary, *Olin Revere Shipping Corporation*. The latter has just contracted for the construction of three special ore carriers by the German ship builder, *Ottensener Eisenwerk* of Hamburg. The ships will be specially designed to navigate shallow depths, because a shallow bar stretches across the harbor used in Surinam, thereby limiting the vessel tonnage carried across it. This new fleet will not be ready before 1959, so *Omnium Shipping Company* of New York will haul the bauxite ore under a charter arrangement.

ARGENTINA—In Cerros Megros, province of Cordoba, a fluorite crushing plant has been erected at a cost of $400,000 (Argentine dollars). This is reported to be the only one of its kind in the country. It is estimated to produce 1,000 tons of high-grade crushed fluorite monthly, and 300 tons of acid-grade flotation concentrate.

LATIN AMERICA—*Hycon Aerial Surveys, Inc.* is conducting an extensive aerial mapping and geophysical program in Central and South America. Super Cessna 195's, modified with 450-hp. engines are used; the added horsepower provides a service ceiling of 26,000 feet.

BRAZIL—Interest expressed by foreign groups in *Sao Joao del Rey* is reported to have caused a market rise in the company's shares. *Bethlehem Steel Company* and a Japanese group are reported to be interested in the firm. It holds about 330 square kilometers in the state of Minas Gerais containing deposits of iron ore, manganese, and bauxite. According to technicians, there is a reserve of 30,000,000 tons of iron ore with an average iron content of 60 percent. Hematite with a 69 percent iron content is also said to occur in the same area.

MEXICO—Jesus Ramirez of Sombrerete has granted a lease to a company represented by Walter A. Edelen, to explore a group of mercury properties located at La Mesa del Esritorio, about 30 miles southwest of Sombrerete, state of Zacatecas. The mine is called *18 de Marzo* and was worked from 1940 to 1946. Operations were discontinued when the price of mercury dropped. The new firm has started to build houses, and to install some provisional retort furnaces. The mercury is deposited in a silicified limestone.

HAITI—*Croinor Pershin Mines* has acquired control of a 20-square mile copper concession in the northwestern part of the republic. Surface exploration will be undertaken shortly. This will be followed by a geophysical survey and possibly some diamond drilling.

ARGENTINA—The plant which *Arrequintin* is erecting in the province of San Juan, County of Iglesia, for the processing of tungsten is expected to go into operation shortly.

CUBA—The *Inter-American Uranium Corporation* has been formed to search for uranium in Cuba. The firm has exploration rights on several plots of land totalling 2,400 hectares. Extensive exploration has already been carried out in the Pinar del Rio province by the firm. President is Wilfredo H. Brito, Jr.

MEXICO—*Mexuscan Development Corporation*, a Canadian firm, will undertake the construction of a 500-ton flotation mill to concentrate 500,000 tons of dumps which were left from operations at the *Minas Quitera S.A.* 80 years ago. These mines are located at Alamos in the state of Sonora. The dumps have an average content of 300 grams of silver, 1.0 gram gold, and 3.0 percent copper per ton

VENEZUELA—The *Venezuelan Geophysical Association* has been formed in Caracas, by 51 charter members who are also members of the *Society of Exploration Geophsycists* of Tulsa, Oklahoma. The Venezuelan group hopes to become a local section of the SEG as soon as the bylaws have been registered in accordance with Venezuelan law. Temporary officers are: C. G. Schauble, chief seismologist for *Sinclair Oil and Gas Company*, acting secretary; Clifford A. Wachter, chief geophysicist for *Venezuelan Atlantic Refining Company*, acting legal representative; and Joseph A. Keeling, geophysical supervisor for *Phillips Petroleum Company*, program chairman.

CUBA—The United States Government will furnish a technical adviser on mining and mineral refining to Cuba's only mineral laboratory. An agreement to this effect was signed by Dr. Emeterio S. Santovenia, president of the Agricultural and Industrial Bank, and John W. Johnston, director of the Point Four program in Cuba. The semi-official bank built the laboratory last year and now plans an expansion program.

MEXICO—A recent study conducted under the sponsorship of the Bank of Mexico and the domestic iron and steel industry estimated that Mexico's iron reserves total 522,800,000 tons. These reserves were classified as follows: known—382,000,000 tons; probable—100,000,000 tons; and possible—40,000,000. Principal source at present is the Cerro del Mercado field in the state of Durango, whose potential is estimated at 50,000,000 tons, or nearly one-tenth of the national reserves. Technicians conducting the study listed the five most important production centers as: Central Pacific—especially the states of Michoacan, Jalisco, and Guerrero which possess the largest deposits discovered to date. (Reserves in this area are calculated as close to 229,000,000 tons, with the best located at Las Truchas, Michoacan, which is still undeveloped); Northern, embracing Zacatecas, Chihuahua, Durango, Nuevo Leon, and Coahuila, whose deposits are placed at 94,500,000 tons; North Pacific, covering Lower California, Sonora, and Sinaloa, 48,000,000 tons; Central, with various dispersed fields, whose extent is estimated at 5,200,000 tons; and Southern, with 6,100,000 tons.

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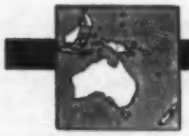


OCEANIA

REPUBLIC OF THE PHILIPPINES—*Balabac Mining Company* has located claims covering an extensive iron ore deposit on Balabac Island in Palawan Province. The newly organized firm found the deposit on a mountain side, and tests made on outcrops showed an average of 55 percent iron, according to reports.

QUEENSLAND—*Hill 50 Central N.L.*, which has switched its interests from gold to rutile prospecting, has purchased from *Rye Park Scheelite N.L.* the *Tewantin* beach leases (earlier rejected by *Standard Ores and Alloys Corporation*, a United States firm). The property is estimated to contain 31,600 tons of rutile, 40,500 tons of zircon, and 2,050 tons of monazite.

TASMANIA—*Rio Tinto Ltd.* is drilling the tin deposits (pyrite-cassiterite) of *Renison Associated Mines N.L.* on the west coast to determine whether the deposits warrant development on a scale that would interest Rio Tinto. The lodes have long been considered to represent Australia's largest tin deposits but are of low grade (about 1.0 percent tin) and complex.

REPUBLIC OF THE PHILIPPINES—*Neilson and Company* reports that contracts have been signed for the operation of a new copper property in Camarines Norte. Copper values of from 3 percent to 27 percent, plus molybdenite, and nickel, are said to be contained in the property.

NORTHERN TERRITORY — *United Uranium N.L.*, operating company for *Uranium Mines N.L.* and *Northern Uranium Development N.L.*, has almost completed a concentrating mill at South Alligator River. Further diamond drilling on the El Sharana orebody gives encouraging results while the Saddle Ridge orebody is now also receiving much attention. The new mill will treat 60 tons of ore a day for extraction of pitchblende.

NEW CALEDONIA—*Broken Hill Proprietary Company, Ltd.* has an interest in and a representative on the board of the *Societe Caledonienne Mineral de Fer*, formed by *Societe Le Nickel*, *Maison Ballande*, and Henri Lafleur. In an initial contract, Broken Hill will receive 160,000 tons of iron ore, but this can be increased to 300,000 tons per annum if Broken Hill desires. The ore, unfortunately, carries 0.19 percent Ni but Broken Hill will blend one ton with nine tons of Australian ore for smelting. Investigations are being made into the possibility of removing the nickel from the ore. Source of the iron ore from Broken Hill will be large, untapped limonite deposits on the Plains de Lacs in the southern part of New Caledonia.

REPUBLIC OF THE PHILIPPINES—In September *Lepanto Consolidated Mining Company* produced 3,711 tons of concentrate, estimated to contain 2,144,220 pounds of copper and 3,522 ounces of gold. The concentrate production contained an average of 28.89 percent copper and 0.949 ounce of gold per dry short ton. The company treated 36,728 tons of ore during September. Average copper content was 3.12 percent, and average gold content 0.126 ounce per ton.

REPUBLIC OF THE PHILIPPINES—Production in September at the *Atlas Consolidated Mining and Development Corporation's Toledo* property on Cebu Island was estimated to contain 1,829,850 pounds of copper and 554 ounces of gold.

INDONESIA—There are plans to reopen the *Bulangsi* gold mines of West Sumatra, owned by *Sumatra Gold Mines Ltd.* In order to get a certificate of "national business," an Indonesian co-director, C. W. Kosijungan, has been named; he will hold a 51 percent interest in the venture. Probably because pre-war output was small (4 kilograms gold and 0.25 kilograms silver in four years), gold mining will be combined with establishment of a glass works which will handle the already treated quartz. According to Mr. Kosijungan, modern machinery from a United States firm will be delivered soon, and U.S. experts will assemble the plant. Ore treatment capacity will be 1,000 tons per day, and can be increased to 10,000 tons per day if necessary. Start of production is dependent upon the cooperation of the government.

WESTERN AUSTRALIA—The reorganization of mines which followed absorption of several properties by *Gold Mines of Kalgoorlie* is having beneficial results, particularly regarding cost reductions. In the last financial year, cost per ton decreased from 74/ to 71/6 and further economies are anticipated. Mill capacity is now 40,000 tons per month. Ore reserves are over 1,500,000 tons at 5.9 dwts. per ton.

NORTHERN TERRITORY—Diamond drilling near Rum Jungle by *Consolidated Zinc Pty., Ltd.* has disclosed considerable tonnages of low-grade lead ore. Plans for extensive drilling operations are being made.

FIJI ISLANDS—Output of *Emperor Gold Mining Company Ltd.* at Vatkuola continues to decline. In three months to August 15, 1956, 28,000 tons of ore treated yielded 10,285 ounces of gold.

NORTHERN TERRITORY—*Northern Australian Uranium Corporation N.L.* has discovered a primary uranium orebody of "great significance" in the Milestone area, 75 miles west of Burketown, near the Gulf of Carpentaria. Milestone is about 500 miles east of Rum Jungle. The deposit is considered of commercial grade, but full results of diamond drilling will not be known for some months.

INDONESIA—A new manganese company will undertake the mining of manganese deposits in Wonosari near Jokjakarta in central Java.

TASMANIA—It has been decided that capacity of the aluminium plant at Bell Bay (Commonwealth Government owned) will be doubled in seven years. Australian aluminium consumption is low on a per capita basis at 22,000 tons per year. Bell Bay has a capacity of 13,000 tons but at present is only operating 100 furnaces (10,000 tons) due to power shortages. Present power supply is 35,000 h.p., an additional 12,000 h.p. being required to achieve full output.

SOLOMON ISLANDS—Following the discovery of gold on Gold Ridge and in its rivers, *Clutha Development Company* has become actively interested. Widespread prospecting is under way. Roads are being built into the areas.

TASMANIA—The Bureau of Mineral Resources will carry out an aerial magnetometer survey near the Hampshire-Blythe River, the Nelson River, and the

INTERNATIONAL

Pieman River (where *Rio Tinto Ltd.* has holdings). The Pieman area, particularly, has rough and densely wooded country. There well could be mineral deposits here for the area is not far from Waratah, location of the famous *Mount Bischoff* mine. Rosebery, Zeehan, and Queenstown are not far by airplane but a road journey of some hundreds of miles is necessary to reach Pieman from these towns.

ONTARIO—*M. A. Hanna Company*, as agents for *Lowphos Ore Ltd.*, a wholly owned subsidiary of *National Steel Corporation*, will open an iron ore property at Moose Mountain, 35 miles north of Sudbury, Ontario. The low-grade iron ore at Moose Mountain will be mined by open-pit methods, and concentrated into a high-grade product by a magnetic process. Planned production is for 500,000 tons of concentrates annually, with operations to get underway sometime in 1958.

ALASKA—*United States Smelting, Refining and Mining Company* has closed its gold operations on Davidson Ditch at Long Creek for the winter. A foreman and ditch tender remained for a short time after the employees had left, in order to complete the shut down operations. A recreation hall at the company's property on Ester Creek was razed by fire shortly after operations there had been closed for the season. Damage was estimated at $25,000.

QUEBEC — *Opemiska Copper Mines Ltd.*, and its parent company, *Ventures Limited*, submitted plans to the Quebec government for erection of a smelter in the Chibougamau copper mining district. The plans are under consideration. Another smelter, the Chicoutimi smelter planned by *Eastern Mining and Smelting Company*, is also projected for this area and might affect the government's decision regarding Opemiska

BRITISH COLUMBIA—The Jumping Lake area of the Caribou mining division has been the scene of a cinnabar claim-staking rush. Dan Rotticker of Fort St. James, who made the original discovery in a new road cut, and partners sold out for $50,000 cash and some $1,000,000 in scheduled payments.

QUEBEC—*Aubelle Mines Ltd.* plans a diamond drill program on its 20-claim copper-gold prospect in the Chibougamau copper district which it acquired earlier in the year. The property is near that of *Newlund Mines* and three miles from *Opemiska Copper Mines*. A geophysical survey outlined a series of magnetic anomalies which require further investigation.

BRITISH COLUMBIA — High-grade lead-silver ore has been opened in an extensive vein system on Adams Plateau near Adams Lake in the southern part of the province. *East Lemhi Mining Company* of Spokane, Washington, has built a 300-foot bridge across the Adams River, completed an access road, and constructed several large, permanent buildings. Some ore has been stockpiled from open-cut development and a tunnel is being driven to provide some stoping ground. Dalton Newfield of Spokane is executive vice president and secretary.

MANITOBA—Henry S. Wingate, president of *International Nickel Company of Canada, Ltd.*, reports that $8,000,000 has been spent in preliminary development in the area around Moak Lake where the firm believes it has a large but low-grade nickel deposit. He estimated that it will cost about $150,000,000 to bring the deposit into production, including a short rail line and power facilities.

YUKON TERRITORY — *Mackeno Mines Ltd.* has opened an ore zone on the 5th level of its mine in the Keno Hill area. Current plans call for further development in depth, including completion of the 5th level drift for the full length of the favorable zone remaining open to the south, and, following this, sinking of a new winze from the 5th to open a 6th level. Completion of the winze is anticipated by February 1957. Milling at the property was resumed in July after a shutdown which allowed mine personnel to concentrate on an intensive development program. Since resumption, the mill has operated continuously at a rate of about 130 tons per day. Grade of mill feed has averaged between 35 and 40 ounces silver per ton and approximately 7 percent lead and 7 percent zinc. Operation at Mackeno are under the direction of *Newkirk Mining Corporation Ltd.*

ALASKA—*Gold Placers, Inc.* located on Coal Creek, closed down for the winter season on October 20th.

BRITISH COLUMBIA—Sigmund Muldal, a forestry engineer, is reported to have located a potentially large nickel deposit in the Nahlin River area of northern British Columbia, 100 miles northeast of Juneau, Alaska. Mr. Muldal has been prospecting during the summers since 1953 for *Canadian Explorers, Ltd.* He says the nickel occurs as millerite.

ARIZONA—*Abbican Mines Ltd.* of Toronto, Canada, has acquired a copper mine 12 miles from Prescott, Arizona and plans to bring the mine into production within six months. The property reportedly was operated more than 60 years ago by J. S. Douglas, founder of the *Phelps Dodge Corporation*. A 200-ton mill has been purchased and is being installed. The firm's engineers estimate that about 420,000 tons of broken ore in stopes, drifts, and dumps carry values in copper and silver.

ONTARIO—*Canadian Johns-Manville Corporation* is said to be considering bringing its *Barton Creek* asbestos deposit near Matheson into production. The firm has been drilling and testing the property for some time and the ore body appears to be much larger than the "A" ore body. One method of mining it, now under consideration, would be through a 2-mile drive from the current workings in the "A" zone. The mill which is now handling about 100 tons per hour would undoubtedly be expanded if the Barton Creek mine is brought into production.

ALASKA—*Totem Exploration Company, Inc.*, formed by a group of Ketchikan men, is drilling prospects for claim owners to prove or disprove a deposit to a certain limited depth. In exchange for a split in eventual profits, if any, after the sale or lease of a prospect to an operating mining company, the firm will undertake some development work in an attempt to interest a large firm in buying or leasing the prospect. This past summer the company drilled several prospects, mostly copper or copper-zinc.

SASKATCHEWAN—*International Minerals & Chemicals Corporation's* two wholly owned Canadian subsidiaries, *Canadian Flint and Spar Company* and *International Agricultural Corporation*, have been consolidated under *International Minerals & Chemical Corporation (Canada) Ltd.* During the past year, the firm continued exploration of the 600,000-acre withdrawal tract where a deposit of potash has been located by core drilling. Evaluation and development of this area will be continued.

NORTHWEST TERRITORIES—*Belcher Bay Mining Corporation* has erected winter camps with ample supplies of gasoline and fuel oil in order to continue diamond drilling throughout the winter season. A successful diamond drill program was carried out during the summer on the magnetite-iron deposit on Innetalling Island in Hudson Bay and the company is now concentrating on intensive diamond drill investigation of its copper discoveries made in the course of drilling for iron.

UNION OF SOUTH AFRICA—*Hartebeestfontein Gold Mining Company Ltd.*, currently milling about 67,000 tons a month, has installed a third milling unit and is changing over from ball milling in the primary circuit to pebble milling

throughout. The extension raises milling capacity to the range from 90,000 to about 110,000 tons a month. The cyanide section is also being extended. Test runs in the uranium plant have been in progress for more than a month and productive operations can be expected in the near future. The trend of development results, which have continued at a satisfactorily high level, continues to be studied closely.

SIERRA LEONE—Diamond smuggling continues on a large scale despite the measures taken by the Government earlier this year. This was acknowledged by H. C. Jacobs, the Financial Secretary, in his recent budget speech when he estimated that "this evil" accounted for the £7,000,000 gap between Sierra Leone's imports last year of £17,000,000 and its recorded exports of £10,000,000.

FEDERATION OF RHODESIA & NYASALAND — *Middle Witwatersrand (Western Areas) Ltd.* has secured participation in several prospecting ventures in Northern and Southern Rhodesia. In the Union of South Africa, drilling in the Standerton-Leslie area to the west of the *Winkelhaak* mine at Kinross in the Eastern Transvaal has yielded nothing of economic importance and has been suspended. In the Hoopstad and Boshof districts of the Orange Free State, options over a considerable proportion of its holdings have been abandoned; but no results have been announced yet in respect of drilling in the Theunissen district.

MOROCCO—The report in the August issue of MINING WORLD, page 85, was inaccurate regarding the status of operations of the *Touissit* and *Bou Beker* lead-zinc mines operated by the *Societe des Mines de Zellidja*. The exact situation at the mines is that, while other mining camps have suffered and violence has taken place nearby, there has been no appreciable change in mine or smelter operations; in fact, mine production has been sufficient for smelter operation without depletion of stockpiles. By comparison with 1955 production, figures for June and July of this year were higher. Output of lead concentrate was 6,300 metric tons in June 1956 and 5,450 in July 1956, compared with 6,197 in June 1955. Zinc output in June and July 1956 increased from 1955 as follows: June 1956, 9,470, up from 8,506; July 1956, 9,681, up from 7,605. Normal and regular operations are continuing at both mines.

UNION OF SOUTH AFRICA — The *Libanon Gold Mining Company Ltd.* has sunk and equipped to its final depth the subvertical shaft in the north-central section to open up the deeper levels. This shaft has been connected with the main shaft on three levels; fourteen other levels are to be cut to reef, on seven of which development has started. Preparations are well advanced for sinking the Harvie-Watt shaft in the southern section. Underground exploration of the small mineralized area beyond the northwestern boundary has been completed with values of 352 inch-dwts over a limited footage; exploration by drilling is being continued.

SOUTH WEST AFRICA—The South West African administration has granted to a new company the diamond concession over the tract half a mile seaward from the high-water mark on the coast, northward from the mouth of the Orange River, for a distance of 160 miles. The new company is the *Suidwes-Afrikaanse Prospekteerders Beperk*. Inland from the high-water mark the concession is owned by *Consolidated Diamond Mines of South West Africa*.

FEDERATION OF RHODESIA & NYASALAND—*Robins Conveyors, Ltd.*, a subsidiary of *Hewitt-Robins, Inc.* of Stamford, Connecticut, has been awarded a $900,000 contract to furnish *N'changa Consolidated Copper Mines* (Northern Rhodesia) with an 8,000-foot-long conveyor system. This system will carry clay and soil stripped from the open-pit mine at the rate of 50,000 cubic yards daily. The overburden will be removed by two bucket-wheel excavators which will cut benches at 86-foot intervals in the huge pit.

NIGERIA—*Ribon Valley (Nigeria) Tinfields Ltd.* produced 213 tons in the year ended March 31, 1956, compared with 113 tons in the previous year. Most of this increase came from the company's *Vom* areas. Because of the uncertain price for columbite, operations will be concentrated on tin from this and other mining areas for some time. The question of whether the deep lead-tin deposits at Sabon Gida can be worked with a new method involving the use of hydraulic underground pumping cannot be answered until the company comes to some agreement with the firm which holds the patents for this process.

NIGERIA — *Naraguta Extended Areas Ltd.* increased its production of tin by 120 tons during the first eight months of this year; this was double the amount recovered during the same period of last year. The increase is due partly to an improvement in the average labor force employed at the mine, and partly to the fact that two deposits are now being worked which were located during the early part of 1956 along the right and left river banks. As yet, insufficient prospecting has been done to establish the extent of these deposits but it is planned to explore them.

MOROCCO—The Minister of Industry & Mines, Thami Wazzani, has announced that a superphosphate plant will be opened in Safi next year. The plant will produce 50,000 tons of super-triple phosphate annually, plus 50,000 tons of sulphuric acid. Employing 1,000 men, the plant will entail an investment of $1,700,000 by the *Sherifian Phosphates Office*, the state monopoly which operates the *Louis Gentil* mines. Output in 1955 from the Louis Gentil operations totaled 1,339,000 tons; this is shipped through the port of Safi.

SOUTH WEST AFRICA—Output of manganese ore from S.A. *Minerals Corporation, Ltd.'s* deposits in South West Africa increased from 13,891 long tons in the second quarter of this year to 15,024 long tons in the third quarter. Shipments in that period rose from 14,030 long tons to 19,123 long tons. In the Transvaal of South Africa, output at the *Rustenburg* chrome deposits was curtailed because of an accumulation of stocks. It therefore dropped from 4,271 long tons to 2,826

long tons; however, sales increased from 5,492 long tons to 6,625 long tons by drawing on the stockpile.

MOROCCO—The managing director of the *Royal Asturian Mines Company*, Jean Juillet, and Alfred Bellier, secretary-general of the Belgian associate, *La Vieille Montagne Company*, met with the Sultan of Morocco in October to obtain assurances from him that special security measures would be taken to protect the miners at the *Jebel Aouam* lead mine in the Middle Atlas region. Mining operations had been called off in March when rebel groups terrorized the region. The Jebel Aouam lead deposit is a vein almost two miles long, varying in thickness between eight inches and five feet, and up to 300 feet in depth. Ore reportedly has a seven percent metal content, capable of producing 8,000 tons a year. Asturian is also prospecting another deposit near Aouam at Moulay Bouazza, and operates important lead-zinc mines at Touissit near Oujda, and Sidi Bou Othman near Marrakesh. In the first six months of 1956, Royal Asturian produced 83,562 tons of lead and zinc concentrates, as compared with 88,589 tons in the first half of last year; plus 32,993 tons of pyrite, compared with 28,050, and 57,984 tons of zinc metal, compared with 56,516.

UNION OF SOUTH AFRICA—In the lease area of 4,920 claims of *Free State Saaiplaas Gold Mining Company Ltd.*, preparations for sinking operations have been virtually completed. In No. 1 shaft, 24-foot-diameter inside lining, excavations to a depth of 62 feet have been finished and sinking is expected to be underway by about the year-end. This will serve primarily as the upcast ventilation unit. About 4,000 feet down-dip or northwest from No. 1, No. 2 shaft has been excavated to a depth of 42 feet. It will have a diameter inside lining of 27½ feet, and will function as the main unit, equipped with three hoists. Three holes were drilled around the side to depths below 2,000 feet and 318 tons of cement injected to seal off any water-bearing fissures, and to facilitate as rapid advance as possible. To a depth of 1,600 feet, operations are not expected to be affected by these fissures which, however, may be encountered below that depth and require cementation. Both shafts will be sunk to depths of about 6,000 feet, and the hoisting capacity will be adequate for an eventual milling rate of 125,000 tons a month. The tonnage of Basal Reef in the lease area has been estimated at 52,000,000 tons. Initial milling at 50,000 tons a month is expected by about 1962.

EGYPT—The Minister of Industry, Dr. Aziz Sidky, has announced that several permanent mineral research centers will be established in various parts of the Egyptian desert to serve as headquarters for the engineers and geologists who are conducting research and prospecting work or surveying the desert areas from the air. The new system is expected to be more advantageous than the old method of sending missions out for a three-month period on a temporary basis. Technical missions are expected to start surveying the eastern desert and Sinai Peninsula soon.

UNION OF SOUTH AFRICA—The Union Government is again concerned with establishing additional harbor facilities on the east coast. A survey is to be made on the cost of railway transport to and the development of a harbor at Sordwana Bay, north of Durban. The Minister of Transport is reported to have stated that another port on the east coast is strategically desirable: the Durban railway system is nearly saturated, while Lourenco Marques is apparently chronically congested. Another port north of Durban would facilitate greater exports of low-rated traffic, especially coal from the Eastern Transvaal. The Minister has also visited the Kimberley-Postmasburg area with a view to accelerating the movement of manganese and iron ore through to the coast.

BASUTOLAND PROTECTORATE—A survey is to be undertaken soon regarding the feasability of constructing a hydroelectric plant in the territory. Upon completion, such a plant would provide power for domestic requirements, and water for parts of the Orange Free State, including the goldfield.

FEDERATION OF RHODESIA AND NYASALAND—Considerable interest is being shown in mining circles of Southern Rhodesia, both private and government, in the possibilities of using the latest airborne geophysical methods to explore the "outback" areas. This interest has been aroused by the announcement that an aircraft especially equipped with a Harwell scintillometer, electromagnetic equipment, and a magnetometer, will carry out demonstation tests in the Federation, as well as contract flying for two large groups. Though the combined airborne approach to geophysics is no longer a novelty in North America, it will be its first application in Southern Africa.

French Bauxite

Continued from page 53 (WM 51)

Since 1945 underground mine equipment has been modernized; 1945 also saw the beginning of the limited modernization of the loading. Today the use of air shovels (Eimco, Joy) is general. The drill Jumbo is used in some headings. Rounds are fired electrically with delay primers. Modern pumping plants handle large output of water. Metal sets (Toussaint frames) are used. Some loading is by electrical or compressed air powered slushers.

The mines are developed by shafts or adits. The main development headings in the bauxite (2.0 by 2.0 or 2.5 by 2.0 meters) are seldom timbered, the ore being of solid consistency.

The developments plan is to drive parallel levels, so as to localize pillars of various ore grades. Drifts are separated from each other by intervals of 3 to 5 meters depending on the grade. Bauxite must be mined cheaply, so expensive filling and metal supports are never used. Caving is always necessary.

Three classical stoping methods are used:

Room and pillar stoping is still being used where there are low-grade layers of less than 5 meter thickness. Between two parallel levels, a stope 4, 6, or 8 meters wide, depending on conditions, is mined upward. The next stope is separated from the first by protective pillars 3 meters thick.

The pillars are then robbed. Subsidence of the back takes place parallel to the levels. The stopes are mined in descending order. Loading is done by slushers downdip. Buckets follow the undulations of the footwall (while a loader on wheels could not do it). Where necessary, stulls support the back.

Sublevel caving was first used in 1920 at the Recoux mine. At Recoux, the operator started to mine bauxite from the outcrops following the moderate dip of about 25° to a depth of almost 50 meters. Around 1920, the mining of pillars was systematically introduced, which consisted of mining the 5-meter-thick slices from top to bottom.

Let us consider a typical stope. It was served by a drift which remained more or less in the axis of the ore body (it was not mined all the way to the geological walls, the ore being of better grade in the middle of the bed than towards the back and the walls).

Starting from the level, perpendicular raises were laid out in the best part of the ore and at distances which seem to have been rather arbitrarily selected. It is possible that these distances depended on the grade of the ore. Each drift was lagged across the back. Generally, removal of the lagging started the cave in the friable ore. The back was drilled and blasted where needed. It was fired, furthermore, into the face of the wall. The broken bauxite, undiluted as slice was started, was later mixed with the waste rock at the end of the drawing. The ore was drawn off through ore passes to a lower underground haulage.

The method had to be changed in 1946 because the ore only had a thickness of 3 to 6 meters. Two slices are now taken at the same time; two perpendicular slices, of 5 meter length, either along the bed or perpendicular to it if the thickness permits. Lagging is removed as mining retreats toward ore pass.

The working team on the levels consists of four men using Eimco 12B or Joy mucking machines; that is, one miner, foreman, one shovel operator, one miner helper, and one haulage man.

Shrinkage stoping is used in steep dipping sediments. Broken ore is loaded from draw holes with mucking machines or scrapers. The variations in the ore make it necessary to take control samples frequently.

Production

The hand worked workings, pitheads and pillars, or sublevel caving are done by 2 or 3 men. When mining is by hand, two or three men work together. The production per shift of 8 hours, for two men, averages 30 tons; for three men, 40 tons.

The mechanized stoping with shovels or scrapers generally takes a crew of four men, one of which is a miner. This crew produces from 80 to 100 tons per shift of 8 hours.

The figure of 100 tons per shift and per stope can be considered as average today for the bauxite. Because of the differences in ore grades, hand sorting from time to time is still necessary. This is only possible in rather small and semi-mechanized stopes.

The workmen are generally from the adjacent countryside and live in the villages of the Var, and the Hérault, among the vineyards.

The average gross income, for 8 hours of work, of the general workers, was approximately 1,500 Frs. in 1955. The salary of the underground miners was approximately 2,200 Frs.

Price

The "red" bauxite containing 55 percent alumina and 5 percent silica (basic reference) was sold in 1955 at the mine for 1,200 Francs per ton (regulated price by the state). The differences in the percentage of the ore content are rewarded or penalized (sanctioned).

U.S.A. Metal & Mineral Prices

METALS

		November 19, 1956
COPPER:	**Electrolytic.** Delivered F.o.b. cars, Valley basis	36.00¢
	Lake. Delivered, destinations, U.S.A.	36.00¢
	Foreign Copper. Valley basis	36.00¢
	Custom	36.00¢
LEAD:	**Common Grade.** New York	16.00¢
ZINC:	**Tri-State Concentrates,** jig, flotation 80% lead, per ton	$201.32
	Prime Western: F.o.b. E. St. Louis	13.50¢
	Prime Western; Delivered, New York	14.00¢
ALUMINUM:	**Tri-State Concentrate,** 60% zinc, per ton	$84.00
ANTIMONY:	**Primary 30 Pound Ingots (99% plus).** F.o.b. shipping points	27.10¢
BISMUTH:	**Lone Star Brand.** F.o.b. Laredo, in bulk	33.50¢
CADMIUM	(In ton lots) price per pound	$2.25
COBALT:	**Sticks and bars,** 1 to 5 ton lots (Price per pound)	$1.70
COLUMBIUM:	**97-99%,** keg of 550 pounds (Price per pound)	$2.60
	Powder Nom., per pound	$120.00
LITHIUM:	98% (per pound)	$11.00-$14.00
	Carbonate	82.00¢
MAGNESIUM:	**Ingots (99.8%)** F.o.b. Valasco, Texas, per pound	36.00¢
MERCURY:	**Flasks.** Small lots, New York	$253.00-$255.00
NICKEL:	**"P" Ingots (5 pounds). F.o.b. refinery, Port Colbourne, Ontario**	64.50¢
SELENIUM:	**99.5%,** per pound	$13.50-$15.50
THORIUM:	**per kilogram:**	$43.00
TIN:	**Grade A Brands.** New York (Price per pound) Prompt delivery	$1.09
TITANIUM:	**99.3% + Grade "A" Sponge (Price per pound)**	$3.00
URANIUM	**Nominal, per kilogram**	$40.00
U-235:	**Nominal,** per kilogram	$11,000.00
GOLD:	**United States Treasury Price**	$35.00 per ounce
SILVER:	**Newly mined domestic.** United States Treasury price	90.5¢
	Foreign Handy Harmon	91.37¢
PLATINUM:	**Per Ounce**	$103.00-$105.00
ZIRCONIUM:	**Sponge, Per Pound,** Nominal	$10.00

ORES AND CONCENTRATES

BERYLLIUM ORE:	**10 to 12% BeO.** F.o.b. mine, Colorado	$45.00 per unit
	Small lot purchases at Custer, S. D., Spruce Pine, N. C., and Franklin, N. H Visual inspection at $400.00 per short ton or by assaying at: 8.0 to 8.9% BeO, $40 per unit; 9.0 to 9.9%, $45; over 10.0%, $50.	
CHROME ORE:	F.o.b. railroad cars eastern seaports. Long tons dry weight.	
	African (Rhodesian). 48% Cr_2O_3, 3 to 1 Ratio	$55.00-$56.00
	African (Transvaal). 48% Cr_2O_3, No Ratio	$38.00-$39.00
	Turkish, 48% Cr_2O_3, 3 to 1 chrome-iron ratio	$58.00
	U. S. Government ore purchase depot Grants Pass, Oregon, Base price, lumpy ore, $115.00; fines and concentrates $110.00 for 48% Cr_2O_3 and a 3 to 1 chromium-iron ratio. Premiums for higher grade ore and for a ratio up to 3.5 to 1. Penalties for grades down to 42% Cr_2O_3.	
COLUMBIUM-TANTALUM ORE:	At United States small lot beryl purchase depots. $3.40 per pound contained combined pentoxides in 50% ore. Includes 100% bonus. (Government stopped buying temporarily May 12)	
	Per Pound Pentoxide.	$1.15-$1.30
IRON ORE:	**Lake Superior. Per gross ton Lower Lake Ports**	
	Mesabi, Non Bessemer, 51.5% Fe.	$10.85
	Mesabi, Bessemer, 51.5% Fe.	$11.00
	Old Range Non Bessemer.	$11.10
	Old Range Bessemer.	$11.25
	Swedish, Atlantic Ports, 60 to 68% Fe. Contracts, Per Unit	22.00¢
MANGANESE ORE:	**Metallurgical grade.** 48 to 50% Mn. Long ton unit	$1.50
	Metallurgical grade. 46 to 48% Mn. Long ton unit	$1.43
	Metallurgical grade. 44 to 46% Mn. Long ton unit	$1.37
	Chemical grade. 80% MnO_2 Per Ton	$70.00
	Domestic U. S. Government ore purchasing depots: Butte, Montana; (black and pink ores) base price of $4.87 per long dry ton of 18% manganese ore. Phillipsburg, Montana; base price of $6.43 per long ton unit of 15% manganese ore. Small lot program f.o.b. railroad cars, minimum 40% Mn. Base price (48%) $2.30 per unit with premiums and penalties.	
MOLYBDENUM CONCENTRATE:	**90% MoS_2 F.o.b. Climax, Colorado.** Per pound of contained molybdenum, plus cost of containers	$1.10
TUNGSTEN CONCENTRATE:	**Domestic.** 60% WO_3 Per short ton unit	$55.00
	Foreign. 65% WO_3 Per short ton unit (Scheelite)	$30.00
	Foreign. South American, Spanish, Portuguese	$29.00
URANIUM ORE:	**Carnotite-Roscoelite. F.o.b. purchase depot plus $0.06 per ton mile ($6.00 maximum), Grand Junction, Rifle, Durango, Naturita and Uravan, Colorado. Salt Lake City, Marysvale, Thompsons, Moab, White Canyon, Green River and Monticello, Utah. Shiprock, and Grants, New Mexico, Edgemont, S. Dakota, Riverton, Wyoming, Tuba City, and Cutter, Arizona.** Base price for 0.10% ore is $1.50 per pound and up to $3.50 per pound of contained U_3O_8 plus $0.75 per pound for each pound in excess of 4 pounds per short dry ton and an extra allowance of $0.25 per pound for each in excess of 10 pounds. A $0.50 per pound development allowance paid on all ore purchases. Special lime schedule applies at Monticello, Moab and Grants. No lime penalty with no vanadium payment or lime penalty with vanadium payment.	
VANADIUM ORE:	**Carnotite-Roscoelite. V_2O_5 in ratio of more than 10 parts to 1 part of U_3O_8 are generally acceptable at all AEC depots but excess not paid for at Marysvale, Monticello, and Bluewater.** Shiprock has no limit on V_2O_5 to U_3O_8 ratio and all contained V_2O_5 is paid for Per Pound V_2O_5	$0.31

NON-METALLIC MINERALS

BENTONITE:	**Minus-200-mesh.** F.o.b. Wyoming points. Per ton in carload lots	$12.50
	Oil Well grade. Packed in 100 pound paper bags	$14.00
FLUORSPAR:	**Metallurgical grade. 70% effective CaF_2 content per short ton F.o.b.** Illinois-Kentucky mines	$40.00
	Mexican. 70% f.o.b. border	$24.00-$24.50
	Acid Grade. 97% CaF_2, Bulk, F.o.b. Kentucky, Illinois, Colorado	$55.00
	Government buying f.o.b. producer's shipping point: 60% Illinois-Kentucky, $34.50 per ton, others $28.50; 70% Ill.-Ken. $38.50, others $32.50.	
PERLITE:	**Crude: F.o.b. mine per short ton**	$3.00 to $5.00
	Plaster grades. Crushed and sized, F.o.b. plants	$7.00 to $9.00
SULPHUR:	Long ton, F.o.b. Hoskins Mound, Texas	$25.50
	Export	$30.50

LONDON METAL AND MINERAL PRICES

		Per Long Ton	November 19, 1956 USA Equivalent cents per pound
COPPER:	**Electrolytic spot**	£285	10s 0d 35.69¢
LEAD:	**Refined 99%**	£120	10s 0d 15.06¢
ZINC:	**Virgin, 98%**	£101	15s 0d 12.72¢
ALUMINUM:	**Ingot, 99.5%**	£197	0s 0d 24.625¢
ANTIMONY:	**Regulus, 99.6%**	£222	10s 0d 27.81¢
TIN:	**Standard, 99.75%**	£850	0s 0d 106.25¢
TUNGSTEN:	**Long ton unit 230 $**	$32.20	

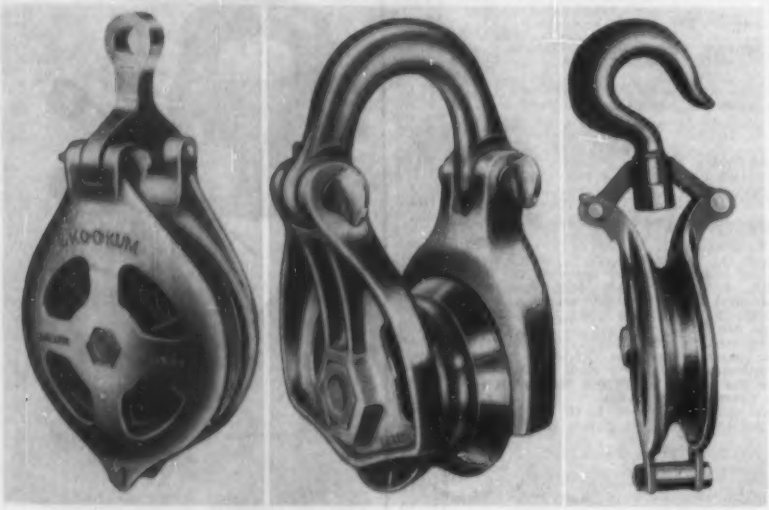
With Sterling pound at $2.80.

Quotations on metals and certain ores through the courtesy of *American Metal Market*, New York, N. Y.

PRODUCTION EQUIPMENT PREVIEW

PEP is just what new equipment, increased mechanization, and new methods can give to your mine, mill or smelter. This PEP section is MINING WORLD's way of making available to you some of the finest current information on mechanization.

New Slusher Blocks Developed By Skookum Co.



Three new slusher blocks for the mining industry have recently been developed by Skookum Company. Looking from left to right you see the models 160, G8, and SM8.

The No. 160 Timken Bearing Mining Block with standard crosshead and the G8 Timken Bearing Mining Block with regular shackle are available with swivel shackle or swivel hook and may be equipped with any type of hanging device required. The No. 160 has a 16" x 2½" manganese sheave, for ⅞" to 1" line.

The G8 has an 8" x 3" manganese sheave with special grease reservoir, for ⅞" to 1" line size, and both the No. 160 and the G8 will sustain a safe working load of 16,000 lbs.

The SM8 is a new ball-bearing mining block, equipped with regular shackle or swivel hook. It has an 8" x 1⅝" manganese sheave, for lines ⅝" to ¾" in size, and will sustain a safe working load of 4,000 lbs.

All three of the new mining blocks may be equipped with sand seals where these are required. Circle No. 62 for further information.

Carpco Appoints Director For Australasia Branch

J. Alan West, sales manager of Carpco Manufacturing, Inc. and general manager of Carpco Export Corporation, Jacksonville, Florida, has been appointed managing director of the new Carpco Australasia Pty. Ltd., Brisbane, Australia.

Mr. West a veteran sales engineer and world traveler, was connected with Guthrie & Co., Ltd. in Malaya before joining Carpco in 1954.

WEST

DYRENFORTH

William P. Dyrenforth has been appointed to replace Mr. West in Jacksonville. Mr. Dyrenforth was formerly with International Minerals and Chemical Corporation, Chicago, where he was a member of the research division in ore dressing and process evaluation. Prior to that he was both a research and sales engineer for the Dorr Company (now Dorr-Oliver) of Stamford, Connecticut.

Caterpillar Forms New Foreign Trade Group

Caterpillar Tractor Company has announced the formation of a new Caterpillar Foreign Trade Group which will combine all activities concerned with the Company's foreign business. Included will be the activities of the Company's present subsidiaries in Australia, Brazil, and Great Britain and two new subsidiaries, Caterpillar Americas Company and Caterpillar Overseas C. A.

William Blackie will be president of the group with W. J. Bornholdt, V. V. Grant, J. R. Munro, and G. E. Spain as vice presidents. Mr. Blackie and Mr. Spain will continue to hold office as executive vice president and vice president, respectively, of the parent company.

Both of the new subsidiaries—Caterpillar Americas Company and Caterpillar Overseas C. A.—will be headed by J. Q. McDonald as president with Mr. Grant as vice president.

On-The-Spot Field Assays With Uranium Analyzer

Designed for on-the-spot field assaying to determine percentage of uranium compound in an unknown ore, this beta measuring instrument has been developed and manufactured by the Eberline Division of the Reynolds Electrical and Engineering Company, Santa Fe, New Mexico. This easily operated instrument allows the application of good judgment in planning further exploration of potential uranium ore fields. Scientific principles, combined with field tested construction, insure accuracy, dependability, long life and simplicity of operation. All components are easily accessible and major units, including plug-in trigger-amplifier and high voltage units, are easily removable with a screwdriver. Circle No. 69 for additional information.

Diesel Generator Delivers 2500 Watts, Weighs 315 lb.

A new type of Diesel generator plant has been developed by Lynn Engineering Co. Called the "Power-Lite," the model DG-2500 puts out 2500 watts at 115 volts. The 60 cycle power unit weighs only 315 pounds, and is said to cost less than some gasoline powered units of the same output. Major design goal was extreme long life with low operating costs. The plant delivers electrical and mechanical power simultaneously through extra power take-off sheave for driving vee belt equipment.

The generator operates at 1800 rpm, is glass insulated and moisture proof, and is powered by a 6 hp German Diesel engine. Circle No. 65 for additional data.

DRY GRINDING MILLS: Hardinge Company, Inc. has recently published a 44-catalog on its line of mills for dry grinding and pulverizing. The catalog discusses the proper application and selection of Conical Mills, Tricone Mills, Cascade Mills, Rod Mills, Tube Mills, and Disc Roll Mills for dry grinding problems. Circle No. 1 for your copy.

SPRAY NOZZLE: Spraying Systems Co. announces a new, large capacity flat spray nozzle as an addition to its Veejet line. Identified as the 24J-Veejet, the capacity of this new type nozzle ranges from 75 gpm at 15 psi, to 330 gpm at 300 psi. The nozzle was designed for heavy duty cooling and washing operations. Circle No. 2 for further information.

TURBOCHARGED DIESEL. Kloeckner-Humboldt-Deutz, AG, of Cologne, Germany have recently developed a new air-cooled turbocharged Diesel engine. According to the company, two models are at present available. The eight cylinder is rated at 210 horsepower at 2300 rpm, and weighs less than 2000 lbs. The 12 cylinder is rated at 310 hp and weighs less than 2900 lbs. These engines are especially advantageous for high altitude operations. Circle No. 3 for further information.

ROOF BOLTING DATA: The September issue of *Haulage Ways*, published by Ohio Brass Co., offers 20 pages of up-to-date information on roof bolting techniques. Information includes data on bolting materials, installation procedures, safety checks, pull tests, and other useful information. Circle No. 4 for your copy.

SLURRY MIXER: Dorr-Oliver Inc., announces the availability of a new bulletin describing the Dorr Slurry Mixer. The Mixer is designed to provide economical, homogeneous slurry mixing for correction, blending, or storage. The new bulletin gives you the full story, circle No. 5 for your copy.

FINE ASSAY WORK and other types of work in the fields of metallurgy and chemistry is available from Abbot A. Hanks, Inc. The company, in operation since 1866, has available help for you in your ore analysing problems based on their many years of experience. Send for their new brochure describing the Hanks' operation. Circle No. 6.

STATION MAGNETOMETER: The Type T615 Station Magnetometer, designed to record the three orthogonal components of the earth's magnetic field, was engineered and produced by PSC Applied Research Ltd., to assist in Canada's International Geophysical Year measurements. The instrument consists of a remote detecting head, an oscillator-amplifier assembly, and a regulated power supply. Circle No. 7 for further information on this extremely sensitive instrument.

SPEED REDUCER: The NICO shaft mounted speed reducer is an economical efficient solution to the problem of applying speed reduction to machinery requiring extremely high torques—beyond the capacity of conventional shaft mounted speed reduction units. The NICO reducer mounts directly on the drive shaft, thus eliminating the need for foundations, flexible couplings, etc. Circle No. 8 for further information.

GM IN MICHIGAN: Clark Equipment Company's Construction Machinery Division is offering GM Diesel engines as optional power plants on two models in its Michigan tractor shovel line. The Michigan models 175A and 125A are now available with a Detroit Diesel 4-71, 142 brake hp, and model 3-71, 105 brake hp, if desired. Circle No. 9 for further information.

FIX PUMP TROUBLES: A new booklet to help locate and correct common ailments of rotary, centrifugal, and steam pumps has been released by Worthington Corp. Cartoon sequence pictures give a full description of pump troubles. Circle No. 10 for your copy.

WHEEL WINCH: A new low cost wheel winch developed by Termac is now available for four-wheel drive bucket loaders. The winch operates from each front wheel, and either one or two may be utilized depending on the load. Circle No. 11 for further information.

NEW DRILL BIT: A comprehensive description of Le Roi-Cleveland one-use drill bits; their construction, specifications, and the preparation of drill rod shanks is given in a recently published bulletin. Circle No. 13 for your copy of bulletin.

BRAKE SERVICE GUIDE: The export division of American Brake Shoe Company has just published a new, 72-page brake service guide in Spanish. Profusely illustrated, the book provides basic information on brakes and friction, explains the five types of actuating systems in general use, and gives complete details for servicing all kinds of regular and heavy-duty brakes. Trouble shooting chart is included. Circle No. 15 for your copy.

GENERATOR BROCHURE: The Detroit Diesel Engine Division of General Motors has issued a new brochure outlining its complete line of electric generator sets. Described are over 25 models ranging from 20 to 245 kw, including 50 and 60 cycle direct current units for emergency standby and continuous off-the-line use. Circle No. 14 for your copy.

SPANISH PUMP BULLETIN: The de Laval Steam Turbine Company has recently issued a new brochure describing its single-stage single- and double-suction centrifugal pumps. Head capacity ranges and dimensions are given for various pump sizes. Circle No. 15 for your copy.

HIGH EFFICIENCY dry type air filter has been introduced by the American Air Filter Co., Inc. The Multi-Pak filter was developed for those applications that require air filters of standard constructioe but needed higher-than-normal cleaning efficiencies. This is excellent filter media to remove dust or smoke even at high temperatures, and with minimum operating costs. Circle No. 16 for brochure.

A LIGHT CATALOG: The Justrite Manufacturing Co. have recently produced a catalog covering their full line of flash lights, lanterns, safety lights, carbide lamps, and safety cans. Tables of performance characteristics of bulb and battery combinations are included. Send for your copy, Circle No. 17.

DIAPHRAGM SLURRY PUMP: Dorr-Oliver inc. announces the availability of a new bulletin describing the "Oliver Diaphragm Slurry Pump". This bulletin describes the features, applications, sizes and capacities, special designs, installation instructions and power requirements of this slurry pump. Circle No. 18 for your copy.

HARDSURFACING CHART: Publication of a comprehensive comparison chart for selection of hardsurfacing welding materials has been announced recently by officials of the Rankin Manufacturing Company. The chart simplifies the selection of Ranite hardfacing rod for their

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specific application. Circle No. 19 for your copy.

DUAFUEL ENGINES: Nordberg two-cycle 21½-inch bore Diesel and Duafuel engines are the subject of a new 20-page bulletin recently published by Nordberg Manufacturing Co. Operating advantages and overall economy of the engines are outlined in the bulletin. Circle No. 20 for your copy.

NEW SCRAPER HOIST: The Ingersoll-Rand Company has developed a new heavy-duty size "41" Scraper Hoist. The new hoist features the I-R "unit assembly". Each unit is made up of its own barrel-type housing, rope drum, gearing and clutch which is independent of the next unit. Models are available from 50 to 75 hp, with rope pulls 5/8 to 9900 pounds. Circle No. 21, and find out more on this hoist.

PLASTIC STEEL: The Devcon company has available a material consisting of 80 percent steel and 20 percent plastic which, according to the manufacturer, is as easy to use as modeling clay for repairing machinery, rebuilding broken parts, filling large and small holes in castings, bonding together many different types of materials. Circle No. 22 for further information.

DROTT SKIDSHOVELS: International Harvester Company has recently made available six new pieces of literature on International Drott Skid-Shovels and attachments. The general catalog covers the entire International Drott line, with on-the-job photos showing units utilizing various attachments, and diagrams illustrating the latest improvements. Circle No. 23.

MAGI-KEY SHEAVE: Introduction of new one- and two-groove "Magi-Key" sheaves for quick and easy speed adjustment of "Texrope" V-belt drives in A and B sections has been announced by Allis-Chalmers Manufacturing Company. Designed for low horsepower applications, the sheave provides for increased maximum design horsepower. Circle No. 24 for bulletin.

SUSPENDED MAGNET BULLETIN: Five major types of Stearns suspended separation magnets for positive removal of tramp iron in conveyor systems are described in a new bulletin. Methods of selecting the proper magnet are described as well as complete specifications and principles of operations. Circle No. 25 for your copy.

DIRECTION REVERSER that permits forward or backward travel at the same speed without shifting gears is the highlight of several new time-saving optional features for John Deere Industrial "420" Crawler and Utility Tractors. This feature is a real time-saver when dozing, digging, or loading. Circle No. 26 and find out more on the useful features of this tractor.

TURBOPOWER DIESELS: A well-illustrated brochure describing General Motors Turbopower Diesels has been issued by the Detroit Diesel Engine Division. Specifications of industrial models ranging from 159 to 300 brake hp are fully described along with features of design and performance data. Circle No. 27.

VIBRATING SCREEN BULLETIN: Construction features of Allis-Chalmers vibrating screens (Model SH) and (Model XH) for handling feed up to six and 20 inches, are described in a new 24-page bulletin released by Allis-Chalmers Manufacturing Co. The screens feature a balanced, two-bearing mechanism and circle throw action which imparts uniform vibration to all parts of the screen surface and body. Circle No. 28 for your copy.

CHOCKING BLOCK: An integrally cast one-piece cast wheel chocking block is now available from the Calumet Steel Castings Corp. This alloy cast steel wheel block weighs about 40 pounds and measures 10- by 10- by 12-inches. It is designed to suit tires up to 60-inches in diameter and loads in excess of 50 tons without failure. Circle No. 29.

FLEXIBLE CHAIN COUPLINGS: Morse Chain Company has available a new catalog on their line of flexible chain couplings. Specifications, dimensions, ratings and application are given on series DSC, series SA silent chain couplings, and series DRC roller chain couplings. Circle No. 30 for your copy.

HORIZONTAL ROTARY: Filter bulletin is now available from Dorr-Oliver Inc. The bulletin describes the outstanding features, design, operation, sizes and capacities of this continuous vacuum-type horizontal filter. Photographs illustrating the filter, and a typical two-stage washing flow-sheet are also included. Circle No. 31 for your copy.

GRINDING MILLS: Nordberg's complete line of grinding mills is the subject of a 12-page bulletin which has just been published. Rod, Ball, Pebble, Tube, and Compartment type Mills with grate, overflow or peripheral discharge are described in Bulletin 232. Circle No. 32 for your copy.

MOBILE GENERATOR: A mobile generating set, permanently housed in a tractor-trailer unit, has been developed by the White Diesel Engine Division of the White Motor Truck Co. The units, available in 350 and 500 kw sizes, are built into Fruehauf trailers and are hauled by White 3000 Series tilt-a-cab tractors. Circle No. 33 for further information.

NEW 85 CFM ROTARY: Ingersoll-Rand Company announces the addition of a new 85 cfm size to its line of Gyro-Flo compressors. The Gyro-Flo 85 weighs only 1340 pounds ready-to-go, fully equipped with tool boxes, fenders, and two-wheel spring mounted running gear. Its size also makes it ideal for truck mounting. Circle No. 34.

NEW ANALYTICAL BALANCE: A data sheet is now available from the Arthur S. LaPine & Company, on their new analytical balance accurate to 1/100,000 of capacity. A knob controlled, 0-1,000 mg fraction loader is included at a comparatively low price. Circle No. 35 for your data sheet.

RECIPROCATING PLATE FEEDER: The National Iron Company has available a brochure describing their new reciprocating plate feeder. The NICO Model 500-C employs four doubled flexible steel cables to suspend the reciprocating plate, eliminating the most troublesome parts of ordinary feeders of this type. Circle No. 36 for your copy.

KOEHRING EXCAVATORS: An attractive catalog describing a newly designed 25-ton lift, ¾-cubic yard dipper capacity 305 excavator has been released for distribution by the Koehring Company. The brochure tells the story of design, construction, work capacity and application of the new heavy-duty excavator. Circle No. 37 for your copy.

DENSITY GAMMAGAGE: The Isotope Products Company have developed a density Gammagage to utilize gamma radiation to measure and control the density hence the percent solids of ore slurries and pulps. According to the company its development has offered a solution to many of the major problems in automatic control of milling operation. Circle No. 46 for further information.

For Free Product Literature see other side

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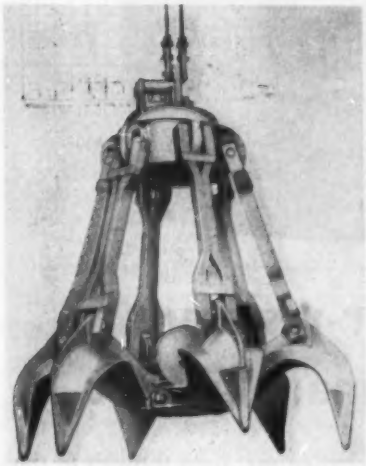
One-Man Magnetometer Saves Time and Money

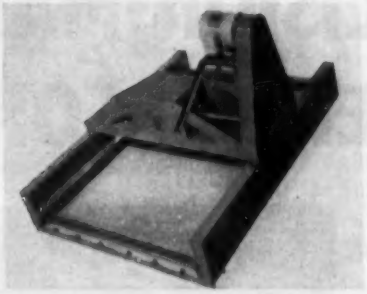
The Sharpe A-2 Vertical Force Magnetometer for mineral exploration, mapping contacts, faults, etc., and for the location of magnetite and pyrrhotite is a one-man instrument which does not require any assistant field operator, as the orienting compass is permanently mounted on instrument. Survey time and labor costs are saved. The instrument has a sensitivity as fine as 10 gammas per scale division, and has a total weight, including tripod, of 13 pounds. Geophysical Instrument & Supply Company of Denver are the U.S. distributors. Circle No. 73 for further information.



Ruhr Model M-1 Grapple Has Independent Tines

The Model M-1 is available with five, six or eight tines, depending on the size of the grapple. Each tine is independent of each other and is positively activated—like fingers of a giant hand—to dig deep into packed or loose material. Final resistance is met with a grip of up to 50 tons which is five times the weight of the grapple.

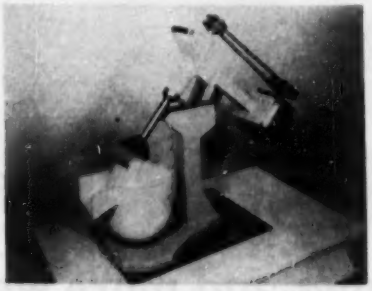
Manufactured by Ruhr Industries of Philadelphia, the M-1 has vertical slideways with "barrel-type" bushings for a maximum vertical and angular tine movement. It is available in sizes from .33 to 3.3 cubic yards. For more information, circle No. 75.



Motor Mount For Special Screen Installations

A high motor mount for the latest Model E Leahy Vibrating Screen, for meeting certain conditions of installation, has been announced by The Deister Concentrator Co. of Fort Wayne, Ind. On the standard type of drive arrangement the motor is supported on an outboard bracket. The high motor mount permits swinging the motor inward leaving only the projection of the sheaves, V-belt and guard of the motor drive.

A space saving advantage is now possible where a large number of screens are to be placed as close as possible, side by side. The high motor mount is also advantageous where it is desirable to have the motor mounted at a greater distance from the screen cloth where material is processed. For further information circle No. 77.



Booth Lab Flotation Unit Has Rubber-Covered Parts

The Booth Company of Salt Lake City has now available their lab size flotation machines which feature a covering of tough, resilient rubber on all the wearing parts of the unit, thus extending the life of these parts considerably. The Booth machine also is provided with two variable pitch sheaves for easy adjustment of rotor speed to suit varying flotation conditions. The cell becomes a conditioner with the air stopcock closed. The positive impelling movement of the ship type agitation impeller, combined with the high velocity ejection movement of the aeration impeller, gives complete and rapid mixing.

For further information on this lab unit, as well as Booth commercial size units, and testing services, circle No. 67.

Notes From The Manufacturers

C. N. REES (left), executive vice president, and NORMAN PITT, chief engineer, both of Standard Steel Corporation, are pictured inspecting the 8- by 80-foot Standard Steel rotary coke cooler recently shipped to Kaiser Engineers for operation at American Gilsonite's new refinery plant in Utah.

The Leo L. Hichcock Company, manufacturers of the Port-O-Powr Diamond Drill, announce an increase in price effective January 1, 1957. According to the company, the increase was due to increased manufacturing costs; however, to partially offset price increase, 50 more feet of drill rod will be included with purchase of drill. A term purchase plan on approved credit is now available.

C. L. Slayman, formerly plant manager of the Timken Roller Bearing Company's Mount Vernon plant, has been named as production supervisor of rock bits.

Fred W. Evans was recently appointed as assistant to the president of Surpass Petrochemicals Limited, Scarboro, Ontario and Alox Corporation of Niagara Falls, New York. He was previously associated with Hooker Electro Chemical Company as supervisor of process development and research.

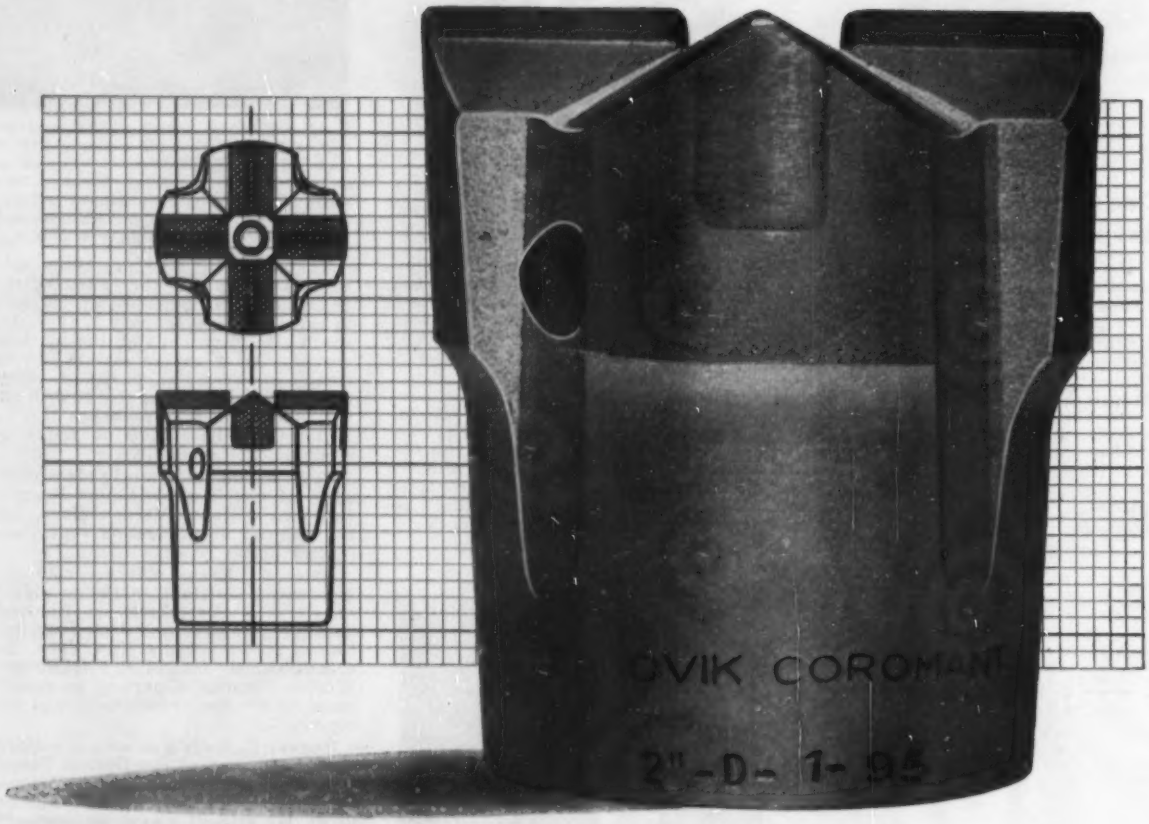
Eugene K. Kelly has been appointed works manager of the Detroit Diesel Engine Division of General Motors. In his new post, Mr. Kelly succeeds Clyde W. Truxell whose appointment as general manager was also announced recently.

The United States Steel Corporation has awarded Western Precipitation Corporation an order for the largest system ever designed for control of open hearth dust and fumes. It will be a complete gas cleaning system including the fabrication and installation of electrostatic precipitators for 11 open hearth furnaces at U.S. Steel's Homestead District Works, Pennsylvania.

The Yale & Towne Manufacturing Company, producer of industrial lift trucks, is launching a full-scale expansion of its sales and service facilities starting with the construction of a factory sales and service branch in Los Angeles.

The B. F. Goodrich Company's new Los Angeles distribution center, housing district sales offices and warehouse facilities for the firm's tire, industrial products and shoe products operations, is at 3525 Garfield Avenue.

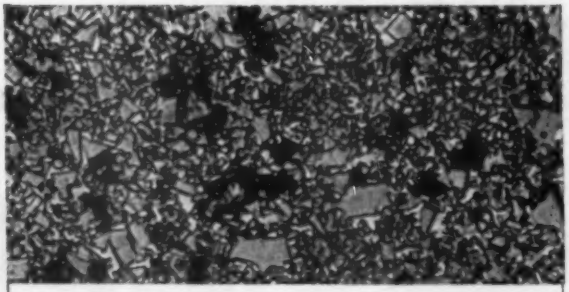
THIS ROCK BIT IS PRECISION-MADE FOR A HIGHER PERFORMANCE



Nothing tougher and more wear-resistant than the insert of a Sandvik Coromant 776 bit

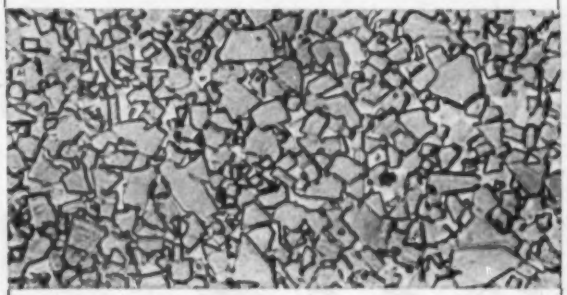
Rock bits that go on *and on* must have highest-grade tungsten-carbide inserts. Nothing but tungsten carbide in its purest state is good enough, will last as long. That's why the carbide that goes into a Sandvik Coromant 776 bit is meticulously controlled.

Sandvik, the world's largest manufacturers of brazed-in tungsten-carbide inserts for rock drilling, control every phase of production. Coromant carbide is scrutinised for impurities from the very first stages of processing the tungsten ore, right through to the final inserts. Add to that Sandvik's special process of securing the insert to the body, employing an exceptionally strong bonding metal, and you know why a Coromant 776 bit lasts longer. In 1955, one billion feet were drilled with these inserts, all fitted to Sandvik Coromant bits or integral steels. *Nothing is more conclusive of the quality of Coromant bits than this figure.*



LOW QUALITY TUNGSTEN CARBIDE

These are unretouched, 1200-times enlarged microphotos. Above, carbide full of impurities. Those black marks are contaminations which are present when production and quality control are deficient. Contamination of this kind weakens the carbide and reduces its working life.



SANDVIK COROMANT TUNGSTEN CARBIDE

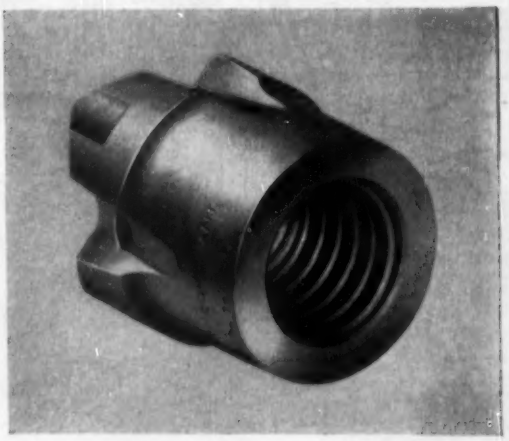
This is Coromant carbide. Notice the uniformity of size and the even distribution of grain. Coromant inserts are free of dangerous porosity and impurities—the reason they go further, have greater strength.

Nothing stands the strain like the Swedish body of a Sandvik Coromant bit

When you put the strongest possible tungsten carbide into a rock bit, the body has to be the strongest available to take the extra strain. That's why Coromant bodies are made of high-quality Swedish alloy steel. But that's not all. Inserts and clearance are cylindrically-ground and the insert ends precision-tooled to exactly the same height. This means *smoother* drilling and *smoother* holes, because the load is equally distributed on all four inserts. *Precision engineering such as this give Coromant bits a longer life!*

Nothing fits like the precision-milled threads of a Sandvik Coromant bit

In order to get a smooth profile of the highest accuracy, Coromant threads are precision-milled in a special thread-milling machine and not made with a tap. Precision-milling too protects the skirt from common fatigue failures.



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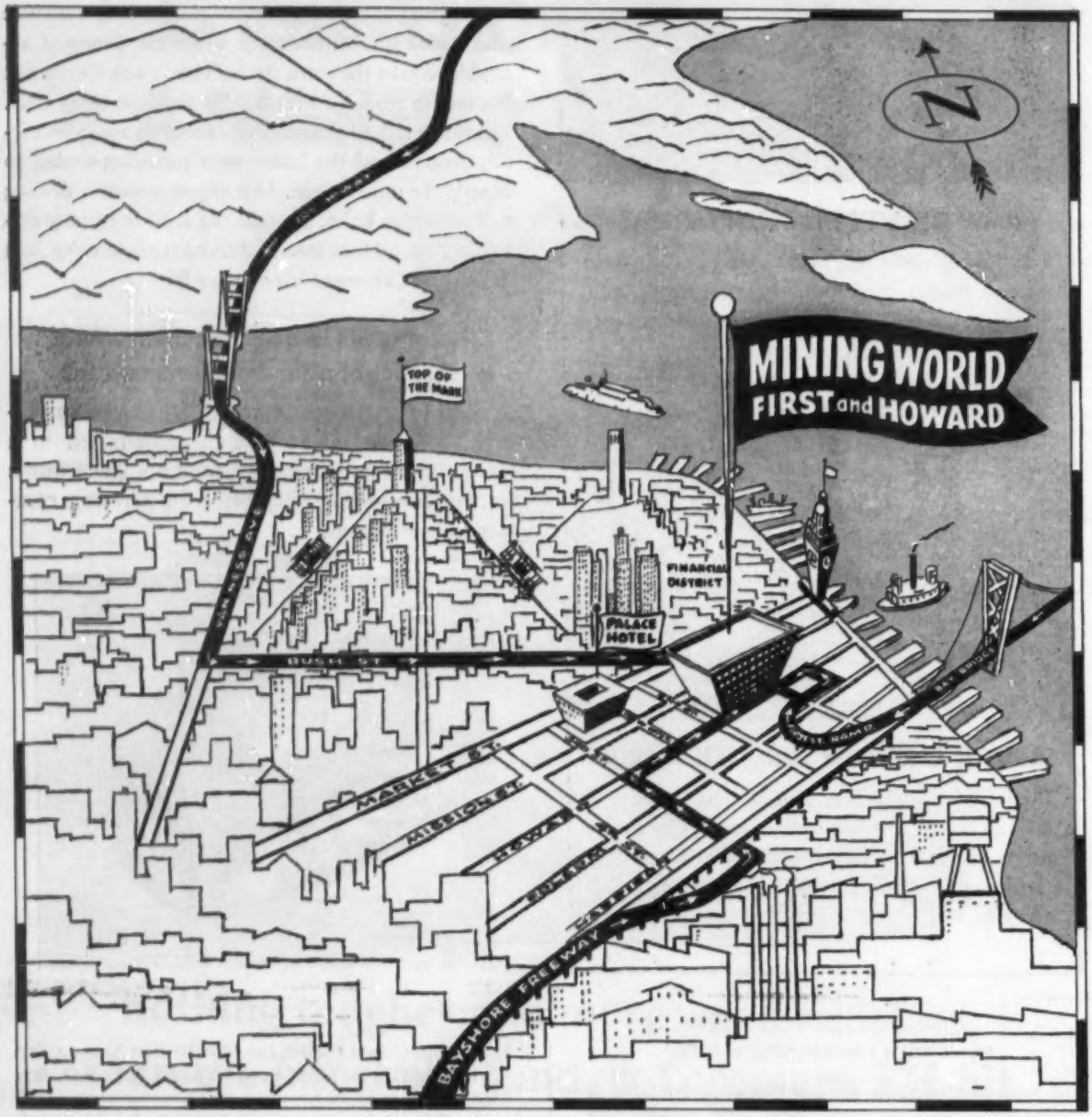

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IDAHO

A second deep shaft is being considered by *American Smelting and Refining Company* at the *Galena* mine, Shoshone County, Idaho which it holds under long-term lease from *Callahan Zinc-Lead Company*. The new opening may be necessary to handle production from extensive lead-zinc ore bodies now being developed. Current production is more than 400 tons of silver-copper ore daily. The company has spent more than $3,600,000 in discovering and developing deep-seated ore bodies in the mine which once was considered to have bottomed out at 1,600 feet. Roger W. Straus of New York City is chairman of the board. J. C. Kieffer of Wallace is general manager of the firm's Northwest mining division.

The *J. R. Simplot Company* reopened its barite mine at Hailey, Idaho in order to mine between 20,000 and 30,000 tons of ore. The plant at Pocatello ground and processed the ore. Ray Bowden, superintendent of the *Gay* mine, was placed in charge of the Hailey operations.

The U. S. Forest Service has been examining the old unpatented mining claims in the Priest Lake area of Idaho's Kaniksu national forest.

Outcrops of uranium-bearing ore between Sandpoint and Bonners Ferry, northern Idaho, have been drilled and blasted by a group of Spokane weekend prospectors who staked 18 claims and leased a section of state land. Members of the group include Lt. Col. Don I. Cameron, commander of the Spokane Air Reserve Center at Fort George Wright; air force Major E. M. Butenko; Eugene Roberts; and Dick Burch.

Idaho Warren Company, Inc. has been granted a state land department permit to operate a dragline washing plant in Warren area of Idaho. The plant will recover gold, with monazite as a by-product. This is the first dredging in the area since the 1942 gold mine closing order.

A newly developed copper mine in Inman Canyon north of Inkom, Bannock County, Idaho has been brought into production by *John E. Smith & Sons Mining Company*. The firm hopes to ship a carload of ore daily to the *American Smelting and Refining Company* in Salt Lake City.

Cuprum Mines of Cuprum, Idaho has been organized with $750,000 capitalization by J. Henry Spivery and C. J. Trickel of Baker, Oregon, and Max E. Peck of Carey, Idaho.

MONTANA

Little Rockies Mining and Development Company has erected a 50-ton-per-day mill near the *Little Ben* property. This property is near Zortman, Montana in the Little Rockies mining district. Another mill recently went into production in this district—the 100-ton-per-day mill of the *Northern Mining Company* located on its *Hawkeye* property.

The *Uranium Corporation of America* is erecting a mill on the *Daly* property near Wickes, Montana. Satisfactory progress is being made in unwatering and preparing the property for mining.

St. Paul Lead Company of Kellogg, Idaho, and *Silver Star Mines* of Wallace, Idaho, have been making shipments of crude lead-zinc ore from the *St. Paul* property south of Libby, Lincoln County, Montana. A 160-foot-long ore body was opened by extending an old tunnel to the 420-foot point. Both carbonate and sulphide zones have been opened. Blocked out and indicated ore is estimated at 10,000 tons. It is planned to put future production through a gravity concentrator constructed on the adjoining *Snowshoe* property owned by St. Paul Lead and *Merger Mines Corporation* of Coeur d'Alene, Idaho. The St. Paul property was obtained under lease and purchase option in 1952 from Walter C. Zollars, Sr. of Libby. Silver Star, maanged by Roy Kingsbury of Wallace, Idaho, entered the venture in 1955. Al Osburn is president of St. Paul Lead.

A 300-ton ore bin has been built at the property of *Holliday Mines, Inc.*, near Noxon, Montana, following the intersection of a 30-inch vein of lead-zinc-copper at the 485-foot point in a tunnel. The mine access road has been improved. Mark V. Holliday of Vancouver, Washington is company president.

Laboratory and pilot-plant tests made by the *Bureau of Mines* indicate that silicomanganese for alloy steels can be made from certain offgrade Montana ores. Samples from the waste tailings dump of the *Domestic Manganese & Development Company* at Butte and from the *Nettie* mine in the Butte-Philipsburg area were studied at the Bureau's Northwest Electrodevelopment Laboratory at Albany, Oregon. Report of Investigations 5255 "Utilizing Offgrade Manganese Materials from Montana" can be obtained from the Bureau at 4800 Forbes Street, Pittsburgh 13, Pennsylvania.

Uranium Explorations, Inc. has been exploring the *Sappington Lease* near Three Forks, Madison County, Montana for uranium, mica, beryl, and vermiculite. Everett E. Trout is company general counsel.

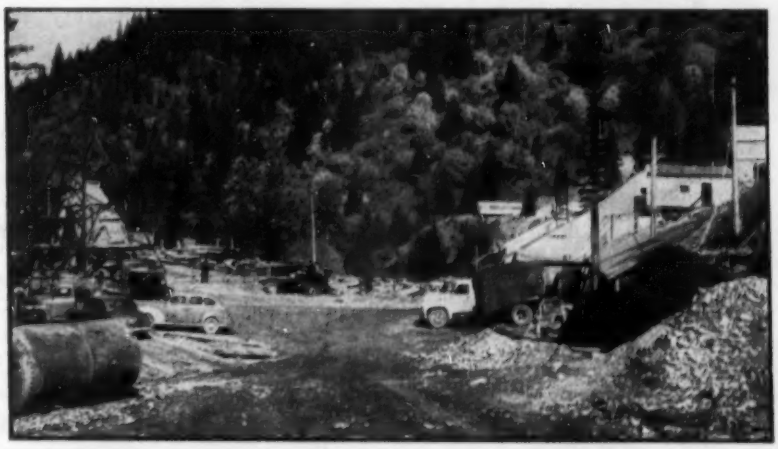
OREGON

A copper deposit has been reported in the southern part of Douglas County, Oregon, and two firms are said to be planning development work. The *Eden* and *Bolivar Copper* companies reportedly have staked claims on about 300 acres of national forest land.

The *Steamboat Cinnabar No. 1* property in Jackson County, Oregon has been acquired by Chester and E. W. Kubli of Jacksonville. Two of the three claims have been reopened, and plans are being made for installation of a furnace.

Low-grade chrome ore from the John Day area of Grant County, Oregon can be smelted to yield ferrochrome-silicon or blended with magnesite to produce refractory brick, the United States Bureau of Mines has found.

A body of high-grade chrome ore is being mined at the leased *Shady Cove*



Conjecture Increases Production with New Mill

Conjecture Mines, Inc. is stepping up production from 50 tons a day to 150 tons with installation of a new ball mill at the old Conjecture mine in the Lakeview district of Idaho's Bonner County. Initial stoping operations got under way recently on the new 500-foot level, where ore averages about six feet in width. Values are mostly in silver, with some lead, gold, copper and zinc. Ore shoots have been increasing in size and grade with depth. Recent improvements include a steel headframe to replace a wooden structure, and a new combination hoist-dry-compresser building. In the photograph above, the new steel headframe can be seen at left, with the mill buildings. A new electric compressor plant in the building at the right foreground, replaces the portable air compressor in the center of the picture. An electric power line has been run into the property by the Washington Water Power Company. The mine is on a two-shift basis, and the mill on three shifts, at last report. Development plans call for deepening of the shaft 200 feet this winter. Walter N. Campbell is mine superintendent, while Donald E. Major is president.

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mine on Chrome ridge, Josephine County, Oregon, by George Tulare and Jack Binder and Sons of Gold Hill. A drilling program is planned. There are 23 claims in the Chrome Ridge group.

Pend Oreille Mines and Metals Company currently is employing 190 men at its zinc-lead property near Metaline Falls, Pend Oreille County, Washington, and about 1,800 tons of ore is being milled daily. A 2,500-foot extension of the inclined shaft is expected to be completed by February for a total length of 6,300 feet. Another crusher station is scheduled at the 1,100-foot elevation. Also planned is a 1,500-foot extension of the ore belt. L. M. Kinney is manager.

As much as 3,200 tons of ore and waste are mined daily at the *Van Stone* open-pit operation of *American Smelting and Refining Company* in the Northport district of Stevens County, Washington. Mill output is 1,000 tons daily. Crews are on a five-day week. *Isbell Construction Company* of Reno, Nevada is the mining contractor. Zinc concentrates are shipped to *Anaconda Company's* Great Falls, Montana plant and lead concentrates to American Smelting and Refining Company's East Helena, Montana smelter. P. A. Lewis is superintendent.

Waddington Mining Corporation is reported to have optioned a large hematite deposit just below the international border, about 36 miles northeast of Bellingham, Washington. The deposit is known as the *Sumas Mountain Ore Field*, and is estimated to contain 12,000,000 tons of 48 percent iron recoverable at shallow depths, and 100,000,000 tons of reserves in a 1,200-acre section. The royalty payment is 60¢ per long ton on a minium extraction of 4,000 tons per day over a 20-year period.

Air-cooled centrifugal pumps, set in stages have made it possible for *Laralarch Exploration and Development Company* to move water more than ½-mile in the Mount Spokane uranium district, northern Spokane County, Washington. The firm, which specializes in diamond core drilling and radiometric assays, has been drilling its own *D. A. Scott* lease. The company is owned by Arthur W. Gural, Spokane diamond driller; Allan R. Bremer, Seattle aeronautical and hydraulic engineer; and Lawrence J. Strong, Seattle electronics technician.

A Tacoma lumberman, W. H. Lindberg, and associates have undertaken to prospect Spokane Indian Reservation permit areas four miles northeast of the *Midnite* uranium mine. Bulldozer stripping was to be followed by drilling.

The first rotary drill rig brought into the Spokane area is being used by *American Leduc Uranium Corporation* in the Mount Spokane district. Initial drilling was on the *Margaret Bowen* lease adjoining the *Daybreak* mine on the west. Harold R. Smith is geologist in charge for the subsidiary of *American Leduc Petroleums, Ltd.*, Edmonton, Alberta.

Gold Bond Mining Company of Spokane has applied for a natural gas franchise for the Blewett-Negro Creek mining area in central Washington. Frank Lilly is president.

Pacific Uranium Corporation at last report was preparing to make a shipment of uranium work from its *Mount Leona* property in Ferry County, Washington to a Salt Lake City processing plant. J. Ellis George is in charge.

Vernon and L. E. Gourlie of Orient, Washington have filed on mining claims in the Orient district; Norman Felsman of Spokane on claims in the Bluecreek mining district; and George V. Llewellyn of Richland on claims in the Deer Trail district, all in Stevens County.

Utahcan, Inc., Spokane, has undertaken bulldozing and drilling exploration of the *Campbell* lease in the Mount Spokane uranium district under an operating agreement with *Rayrock Uranium, Inc.* Gordon Berkhaug is managing director and vice president of Utahcan.

The old *Walla Walla* copper-gold property on Goosmas Creek, northern Ferry County, Washington, has been leased by Harry Hill of Spokane and John Higgins of Zillah from Charles Rogers and Bill Klinehans of Curlew. Mr. Higgins is directing exploration work.

Mudhole Exploration, a partnership of Frank Duval, Frank Duval, Jr., Adolf Nissen, Duane Watters, Ralph Umbreit and Frank Granger of Spokane, has been test drilling a radioactive zone near the Spokane County-Pend Oreille County boundary.

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Work at Inspiration Indicates Large Reserves

Development work so far completed at the Christmas mine, near Winkelman, Arizona, indicates an ore reserve of 10,000,000 tons of 2 percent copper ore in the O'Carroll Bed, with the possibility of additional tonnage of lower grade ore, according to Richard S. Newlin, president of Inspiration Consolidated Copper Company. Inspiration has been conducting an intensive exploration and development program at the Christmas mine since February of 1954 with total costs up to September 30, 1956, reported at $2,183,352.

In the course of drilling to the O'Carroll Bed, ore of lower grade has been encountered in intermediate levels, and the presence of high-grade primary mineralization in another area has been disclosed. These ore occurrences have not been sufficiently well evaluated to permit an accurate estimate of tonnage and grade, but the aggregate addition to the ore reserves is expected to be substantial.

Inspiration's present plans for the Christmas mine call for a concentrator of 2,500 tons daily capacity, designed so that it may be expanded as needed. The new McDonald production shaft and hoisting equipment will have a capacity of more than double the expected initial mill tonnage. Engineering and design work is well under way, and the physical construction on numerous phases of the project is scheduled for early 1957. On the basis of present construction schedule, the Christmas mine should start producing in the second half of 1959.

Shasta-Phelps Dodge Exploration Continues

Shasta Copper-Phelps Dodge Joint Venture is continuing its copper-zinc-pyrite exploration program in California's West Shasta district, Shasta County, north of Redding. Exploration is directed by E. E. Maillot, Phelps Dodge geophysical engineer, with headquarters in Douglas, Arizona. Field work is supervised by Bill Allen.

Work at the Shasta King, Sugar Loaf, and Balakalala mines consists of road building, magnetic and resistivity surveys. Diamond drilling is being used to check anomalies indicated by the geophysical surveys. Drilling on the Balakalala claims is being done under a recently approved DMEA contract for $109,872.

Management and operations of the joint venture are directed by a five-man board headed by Walter C. Lawson, general manager of PD's western operations. Other board members are: W. A. Evans, Phoenix, Arizona; G. A. Swanson, Douglas; K. L. Stoker, Shasta Copper president; and W. J. Walker, Shasta geologist.

Construction on Schedule At National Potash Mine

Construction work at National Potash Company's new mine near Carlsbad, New Mexico, is proceeding on schedule with shipments due to begin in February. Richard C. Wells, president of the company which is jointly owned by Freeport Sulphur Company and Pittsburgh Consolidation Coal Company, said that the two mining shafts are down to the ore level, the 21-mile water pipeline is in operation, and the refinery and other facilities are nearing completion.

The $19,000,000 project will have an annual capacity of 400,000 tons of high grade muriate of potash guaranteed 60 percent K_2O. Product storage buildings, already completed, have a capacity of more than 100,000 tons, sufficient to meet the peak fertilizer demand period. Provisions are being made for quick loading of the bulk or bagged product into covered hopper cars or standard box cars.

A reduction of $6,000,000 in the assessed valuation of the *Silver Bell* mine of *American Smelting and Refining Company* and a tax refund of $217,416 were ordered in October as the result of a suit filed against the Arizona State Tax Commission in the Pima County Superior Court. American Smelting and Refining Company had paid under protest its 1956 tax bill of $740,919.48. The tax was based on a mine valuation of $17,000,000, and a total valuation for mining claims and plant facilities of $20,221,109. In 1955 the mining claims had been valued at only $7,000,000, and the total valuation of the property was $10,420,106. Ore production at the Silver Bell mine, located at Silver Bell, Arizona, was initiated March 1, 1954, and on July 1, 1956, had totaled 6,219,000 tons averaging 0.93 percent copper. At present, the concentrator is treating a daily average of 7,730 tons of ore. In addition to the copper concentrate, about 1,500 pounds of molybdenite concentrate per day is produced.

Construction work has been started on a 200-ton per day concentrating plant at the *Old Dick* mine, near Bagdad, Arizona, with completion scheduled for early next year. Contract for the plant is held by *O. W. Walvoord, Inc.* of Denver, Colorado. The Old Dick is a zinc-copper deposit and the new plant will produce, by flotation, copper and zinc concentrates. Underground work, in preparation for actual production, is directed by Curtis Sundeen, resident manager. The Old Dick was acquired by *Cyprus Mining Company* early in 1955 and an extensive exploration and development program has been underway since that time.

Walter E. Remmers, vice-president of *Union Carbide and Carbon Corporation* in New York, and associates are reported to have taken over the *Copper World* mine near Yucca, Arizona, and to be planning an active exploration program. Initial plans are said to call for sinking a 100-foot shaft and about 400 feet of underground exploration. The Copper World is owned by R. L. Dye and J. H. Bathrick of Kingman, Arizona.

Inspiration Consolidated Copper Company, Inspiration, Arizona, expects to complete the construction work at its concentrator about December 1, at which time the shift from ferric sulphate leaching to acid leaching, followed by concentration, will be made. Completion of the new plant will give Inspiration a productive capacity of about 85,000,000 pounds of copper annually. Conversion of Inspiration's metallurgical plant to the so-called "dual process" is being accomplished at an estimated cost of $5,660,000.

Bear Creek Mining Company, exploration subsidiary of the *Kennecott Copper Corporation*, has staked a substantial amount of land in the Halloran Springs district east of Baker, California. In the late 1920's the area was a copper, lead, zinc, silver, and gold district, and in the 1930's produced talc. Rare earths, including thorium and uranium, may ultimately be mined in the district.

The *Nissho California Corporation* representing the *Nissho Company* of Tokyo, Japan is in the market for iron ore for export to Japanese mills. They will buy 100,000 tons or more of lump iron ore assaying 58 percent plus iron, with a maximum P content of 0.5 percent, S, 0.3 percent, and Al_2O_3 plus SiO_2, 15 percent. Mine operators may contact the firm at 130 Montgomery Street, San Francisco, California.

Bert Austin and associates are dewatering the old *Altoona* mercury mine in Trinity County, California with the aid of a DMEA loan. They have dewatered the shaft to the 600 level, making it the first time the 600-foot level has been accessible since 1903. *Marsman and Company* operated the mine during World War II but mined on the upper levels. Exploration of the 600 level has now disclosed good grade mercury ore so plans are underway to install a furnacing plant.

Consolidated Virginia Mining Company has awarded a contract to *Robinson Diamond Drilling Company* for work on its gold and silver properties on the Comstock Lode at Virginia City, Nevada. The objective of the present drilling program is to define gold and silver mineralization both laterally and at depth in a virgin area on Mt. Davidson where the Cole outcroppings extend 1,200 feet along the Comstock. Open-pit operations are planned by the company.

Resumption of operations by *Pioche Mines Consolidated* in the Pioche district of Nevada may be undertaken soon as a result of a decision of the United States Court of Appeals. The mines had been tied up in litigation since 1940 when *Fidelity Philadelphia Trust Company* filed suit against the mining company on behalf of the holders of Pioche bonds sold in 1928. The U.S. Court ordered dismissal of the suit. The firm now plans to renew operations in its lead-zinc-silver mine as soon as possible.

Federal Uranium Corporation of Salt Lake City, Utah has entered into an agreement with *Constant Minerals Separation Process, Inc.*, whereby Federal will operate two properties in Ne-

MARIONS IN ZINC

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vada. In turn, Federal will loan Constant Minerals $100,000, repayable out of production. Federal also acquires a 50 percent of the net profits after first recovering development expenses. The properties are the *Galena Hill*, a lead-silver mine 11 miles south of Reno, and the *Rabbit Hole Placer*, a gold property 57 miles north of Lovelock. This marks Federal's first activity outside the uranium field.

A uranium strike was made recently on the *San Juan* claims north of Austin, Nevada, according to Walter H. Schwedler, chairman of the board of directors of *Sunburst Uranium Corporation*. A shaft is now being sunk to the vein which is in rhyolite. Sunburst holds about 2,600 acres in the Austin and Tonopah regions, and also some claims on the Colorado Plateau near Moab, Utah.

Production crews of *Kennecott Copper Corporation's Nevada Mines Division* established a record tonnage day at the Veteran Pit by mining 58,678 tons. The record was set in September by the cooperative effort of shovel crews and truck drivers during three operating shifts.

Metals Exploration Corporation, which organized three mining companies in Nevada, has announced that it plans to build a 100-ton flotation mill to handle mercury ores in eastern Pershing County. The firm also reports it is looking into possibilities of mills for treatment of tungsten and perlite.

Bill Peterson and a crew of five are reopening the old *Yellow Tiger* mine, now called the *Silver Reef*, at the former ghost town of Tigertown near Tonopah, Nevada. They have graded the road and brought in mill machinery; cleaned and retimbered the mile-long tunnel; and replaced the pipeline.

Kennecott Copper Corporation's Nevada Mines Division has installed a new process for the recovery of higher grade concentrate. It is the full-scale cyclone classifier regrind unit to be used at any of Kennecott's divisions. Since the process has been in effect, preliminary results indicate that the grade has been increased from approximately 18 percent copper to 23 percent copper—an increase of 28 percent. The new technique has resulted in a 14 percent reduction in the concentrate tonnage produced.

NEW MEXICO

Phillips Petroleum Company has paid $1,750,000 for a quarter interest in *Holly Minerals Corporation's* uranium deposit in the Ambrosia Lake area of New Mexico. Holly says that it will use the money to develop other properties, including copper, asbestos, and mercury, as well as uranium. The company currently operates the *Beacon Hill*, *Flat Top*, and *Mesa Top* mines in the Grants area. August shipments totalled 4,224 tons valued at $75,000.

Sabre-Pinon Corporation is negotiating with the AEC for a milling contract to apply to ores in the Ambrosia Lake region, but not under an agreement it had with *American Metals Company Ltd.* Conferences are now being held, instead, with *Phillips Petroleum Company*, *Kerr-McGee Oil Industries Inc.*, *Kennecott*

SOUTHWEST

Copper Corporation, and—reportedly—with *Texas-Zinc Minerals Company*.

Operations have been started by the *Magnetite Corporation* on an open-pit mine in the vicinity of Capitan, New Mexico. About 25 men are engaged in mining and crushing the magnetite iron ore. Paul Brenton is president and general manager.

Kerr-McGee Oil Industries, Inc. of Oklahoma City, Oklahoma, is now operating a new solvent extraction installation for the recovery of uranium at its concentrating plant at Shiprock, New Mexico.

United Western Minerals Company of Santa Fe, New Mexico is preparing to sink a 400-foot, two-compartment shaft in the Ambrosia Lake area of New Mexico. The company recently formed a limited partnership with *Homestake Mining Company* for construction of a 750-ton uranium processing mill and mine operation. Negotiations with the AEC are under way.

The *St. Anthony Uranium Corporation*, a wholly owned subsidiary of *Climax Molybdenum Corporation*, has started shaft sinking operations at its property in Valencia County, New Mexico. The three-compartment shaft will be sunk 300 feet to the ore body which is estimated to contain 200,000 tons. Drilling has indicated it to be about 800 feet long and 300 feet wide, varying in thickness from a few feet to 27 feet.

Yucca Uranium, Inc. of Albuquerque, New Mexico has acquired all of the assets of *Falcon Uranium and Oil Corporation*. Each firm owned a half interest in about 550 claims, and Falcon's interest in 296 other claims was included in the transaction.

Incorporation of *Western Exploration and Development Company* of Silver City, New Mexico has been granted. Incorporators are Harry J. Harris and Grace Harris, of Melrose Park, Illinois; Albert E. Beasley, Las Cruces, New Mexico; and Joe Hodges, Jr. of Silver City.

Increased mining activity is seen in the Borro Mountains, near Silver City, New Mexico, and also in the White Signal mining district. A group of manganese claims on the lower Gila southwest of Redrock are under development by the *Fritzi Mining Company*, in which James A. Stewart and Bruce Leake, of Silver City, are interested.

Indians of Laguna Pueblo, whose lands in west central New Mexico are in the heart of the big uranium development boom, reportedly are netting an estimated $200,000 per month from royalties.

TEXAS

Jones & Laughlin Steel Corporation has taken an option on 5,000 acres of land near Houston, Texas as a site for a proposed steel plant.

Ore Research and Laboratories, Inc. has been organized in Dallas, Texas to provide a variety of technical services by specialists in geology, geophysics, chemistry, mathematics, and electronics.

Vitro and AEC Sign New Processing Contract

A new uranium concentrate purchase contract signed by the U.S. Atomic Energy Commission and the Vitro Uranium Corporation of Salt Lake City, Utah, provides for an increase in plant capacity, installation of a new process, and extension of the contract from December 1958 to March 31, 1962. The Vitro plant has been in operation for five years.

In overhauling the plant and increasing the capacity, Vitro will install a new and more efficient uranium extraction process known as the liquid-liquid solvent extraction process. Estimated cost is $1,200,000.

In addition to processing ores from mines the company may own, lease, or otherwise control, Vitro will continue to purchase ores offered by independent producers if they are economically and metallurgically amenable to the plant at prices not less favorable than those embodied in Domestic Uranium Circular 5, Revised.

Rico Argentine Mining Company at Rico, Colorado reports that a total of 34,020 dry tons of lead-zinc mill ore was produced in the fiscal year ended June 30, 1956. The *Mountain Springs* area furnished 28,402 and the *Argentine* area supplied the balance of 9,938 dry tons. Ore taken out of the St. Louis Tunnel amounted to 2,025 and this is included in the total for the Argentine area. In addition, 859 tons of flux grade pyrite were mined and shipped from the Mountain Spring area. The St. Louis Tunnel has now drained most of the old mine workings in the Argentine area. Production was resumed during the year from both the 200 and 300 levels after the water drained down. Near the end of the fiscal year, a flotation plant to upgrade tailings was constructed. This plant, working on the lower grade portions of the tailings, produces a pyrite concentrate averaging from 45 to 50 percent sulphur. By this up-grading, the acid plant will be able to run approximately another year and a half from the tailings. In the meantime, preparations will be completed to mine the pyrite underground on an economical basis. Several million tons are reported to be blocked out.

The *Texas-Zinc Minerals Corporation* has purchased a minority interest in the *White Canyon Mining Company* from F. A. Sitton, president of the firm. White Canyon owns uranium properties in Utah. Texas-Zinc purchased 35 percent of the stock which actually amounts to operating control since the remaining 6,900,000 shares are held by 6,700 stockholders. Texas-Zinc has named four of its men to the board of directors of White Canyon, including its manager Arnold L. Hayes who has been elected president. White Canyon's ore will be processed in the new plant planned by the firm at Mexican Hat.

As a result of successful pilot plant work, *Howe Sound Company* plans to erect an electrolytic plant to handle all of the refinery output at Garfield, Utah. This installation will replace the final, or reduction step, of the Chemco process. Operation of the new plant is anticipated by late 1957, with expenditures estimated at $750,000.

Management of the 160-claim *Ransom* uranium mine near Blanding, Utah has been taken over by *Sunshine Mining Company* of Spokane, Washington. It has joined with *Silver Syndicate, Inc., Sunshine Consolidated, Inc.,* and *Clayton Silver Mines,* all of north Idaho, in purchase of a remaining 80 per cent interest in the *King Edward* and *King James* claims, and in an operating agreement on the other 158 claims. The firms previously had acquired two-thirds of the other 20 percent interest in the two claims, the principal producers to date. Robert M. Hardy Jr. of Spokane is Sunshine president.

Hecla Mining Company of Wallace, Idaho, operator of *Federal Uranium Corporation's Radon* uranium mine in San Juan County, Utah's Big Indian district, has agreed to explore the *Tucker Flat* and *Big Flat* claims in the same district. The properties are owned by *Uranium Mines, Inc.,* also of Wallace. The initial drilling program calls for 12 holes. L. J. Randall of Wallace is Hecla president. Robert E. Brown, Kellogg attorney, heads Uranium Mines.

Lisbon Uranium Corporation of Salt Lake City, Utah reports that its Ike shaft should be completed this month in the Big Indian district of San Juan County. Production will be at a rate of about 6,400 tons monthly by April. Bids have been let for sinking of another 600-foot, two compartment shaft on the *Columbia* claims in the same area.

The uranium ore-buying station and sampling plant operated at Moab, Utah, since early 1954 by the *U. S. Atomic Energy Commission* has been placed in a standby condition at the close of business on October 31, 1956. The new *Uranium Reduction Company* processing mill at Moab, now in operation, will provide a future market for most of the uranium ore producers in the area. The remaining shippers whose ores are not accepted at the URC plant will be offered a market at the Monticello, Utah buying station and sampling plant. At the Moab buying station, operated for the Commission by *Lucius Pitkin, Inc.,* a skeleton crew is on duty to maintain the property and supervise the removal of stockpiled ore to the various mills.

Cliff Development and Exploration Corporation of Salt Lake City, Utah has taken a lease and bond on the *Showers* mine at Silver City, Utah. The mine is owned by *Showers Standard Mining Company.* The property will be rehabili-

Future Growth Indicated for Edgemont Mining

Operations of Edgemont Mining & Uranium Corporation in the Black Hills of South Dakota may be expanded, according to reports from officials of Giants Resources, Inc. The latter firm acquired 3,000,000 shares of Edgemont stock on September 18 and will operate the South Dakota producer as a subsidiary. Shown above is the portal of Edgemont Mining & Uranium's Gould mine, 10 miles east of Edgemont, South Dakota. The Gould is the largest mine in the district with a daily production of a little over 100 tons of ore. Mine output is hauled from the underground workings to the surface by an Allis Chalmers HD 7 tractor which pulls a 6-ton-capacity, rear dump trailer. Ore is extracted by room and pillar methods from a massive sandstone formation. Two separate ore horizons have been noted at the Gould mine with carnotite mineralization occurring near northwest-southeast fractures which cross the deposits. Some 2,000 feet northeast of the present workings, earlier drilling had disclosed extensive uranium mineralization. Check drilling is now proceeding to gain reliable information of the grade and extent of this deposit which will be developed by open cut means if it appears feasible. President of Giant Resources, Inc. is Colonel T. R. Gillenwaters. Giant Resources recently merged with Mountain Top Mining & Milling Company which has a silver-lead property near Silverton, Colorado. The president of Edgemont Mining & Uranium is Lee Cox and Ed Gillenwaters is general manager.

tated and put into production as soon as a geophysical survey has been completed. This will be followed by diamond drilling of the mineralized zones found by the geophysical survey. W. C. Dunham is geologist and president of the company.

A Seattle, Washington firm, *Columbia Uranium Inc.*, has located a uranium ore body in the Green River Canyon southeast of Green River, Utah. The discovery was made on the *Edna No. 3* claim, one of the 64 held by Columbia, on the east side of the river. The firm also owns 120 claims in four other Utah areas. An incline shaft has been sunk to reach the ore body, and an initial 50 tons were shipped in September. Sam Thomas is president of the firm.

The *H.M.&S.* tungsten mill at Salt Lake City, Utah has been purchased by *Sun Star Milling Company*, an affiliate of *Sun Uranium Corporation, Lucky Star Uranium*, and *Baggs Uranium*. The mill will treat tungsten ore from all three firms which are operating in the Newfoundland Range, 40 miles north of Knolls in Toole County.

Continental Uranium, Inc.'s joint venture exploration program on the *Deer Flats* property in Utah is proceeding favorably. An adequate amount of uranium ore has been blocked out to establish a mine. Further development will determine the full extent of the ore body and location of the mine portal.

WYOMING

Carl Lough, president of *Loma Uranium Corporation*, disclosed his firm is considering construction of a uranium processing mill near Douglas in Converse County, Wyoming, adjacent to some 80,000 tons of ore the firm has blocked out. He said his firm and others are handicapped by having to truck their ore 165 miles to Edgemont, South Dakota. He said he believes there is sufficient ore to warrant a mill. During the month of October, Loma shipped 1,500 tons of uranium ore, and with the opening of the second pit on the *Hardy* and *Zee* property, we expect to increase this production to approximately 3,000 tons per month. Other nearby property appears to be promising and is being explored.

Reynolds Metals Company has announced it has picked up its option on a 4,000-acre tract adjacent to Lake De-Smet, Wyoming, looking to possible construction of an aluminum reduction plant. Walter L. Rice, president of *Reynolds Mining Corporation*, a subsidiary, said the company plans to take possession soon. The tract reportedly covers an unusually large seam of coal measuring more than 100 feet in thickness relatively close to the surface. He pointed out the coal and the ample water supply from the lake provide essentials for generation of large quantities of electricity needed for aluminum reduction.

Phelps Dodge Corporation has four drill rigs working on close-center uranium test drilling on property of *Wyoming Uranium Corporation* in the Crooks Gap area of central Wyoming. The number of drilling rigs was reduced from nine to permit closer supervision in drilling out an ore body. Most of the drilling will terminate shortly because of winter weather.

Round-the-clock work is under way on construction of *Lost Creek Oil and Uranium Company's* $3,000,000 uranium processing mill in the Sweetwater Valley of central Wyoming, near Crooks Gap. Foundations have been poured and work will start soon on erection of mill buildings. It is hoped to have the buildings enclosed before winter so work may proceed during the area's extremely cold weather. *Western Knapp Engineering Company* of San Francisco, with Art Edsen as superintendent, is building the mill. At the nearby townsite being built by Lost Creek, the first of the 26 houses to be constructed this winter are nearing completion.

New DMEA Contract For American Zinc

American Zinc Company of Tennessee is drilling an area known as Strawberry Plains, across the river from its Mascot properties, under a $768,000 DMEA contract. The contract covers approximately 335,000 feet of diamond drilling, and 50 percent of the cost will be paid by the federal government.

The spacing of the drill holes in this area will be approximately 800 feet, and the company will drill 200 holes. Work is to be completed by September 1, 1958. The contract provides for the company to pay the government a royalty on any mineral production from this area until the government has been fully repaid. These payments are measured by production within a 30-year period.

The company also has an option on 1,850 acres at the same price it had been paying for mineral rights in the East Tennessee area.

On the DMEA contract known as the Southwest New Market area in Tennessee, drilling was completed in October. A rough calculation of the tons of crude ore indicated by this drilling was that major tonnage is in four areas carrying from 4,000,000 to 11,000,000 tons, each with a total of approximately 26,000,000 tons of ore. In the smaller areas, about 10,000,000 tons was indicated. Total in all areas under this contract indicated approximately 35,000,000 tons of crude ore with approximately 2,000,000 tons of 60 percent zinc concentrates.

The firm expects to complete purchase of mineral rights on all promising acreage in this project during the next year.

New GSA Buying Rules for Fluorspar, Asbestos

New regulations have been formulated for the purchase of domestically mined fluorspar and asbestos by the General Services Administration's newly formed Defense Materials Service. Time and quantity objectives have been established for both programs. However, contracts will be made initially only for such quantities as can be purchased with available funds. As additional appropriations become available, other contracts will be negotiated.

Purchases of fluorspar will make up to a total of 250,000 short tons of newly mined acid grade or until December 31, 1958, whichever occurs first. The GSA will pay a base price of $53 per short dry ton for material meeting the national stockpile specification in order to provide temporary assistance for producers. A sliding scale of prices is established for material either below or above the specifications.

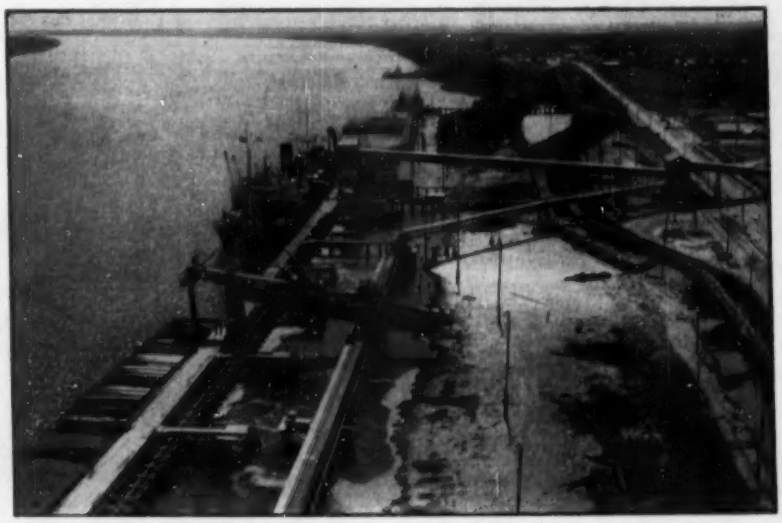
The GSA will purchase a total of 2,000 tons of the top two grades of chrysotile asbestos by December 31, 1958, when the program will terminate if the total has not been reached earlier. For crude No. 1 asbestos, the price is $1,500 per short ton; for crude No. 2, $900 per short ton. Crude No. 3 will be purchased at $400 per short ton, but only when offered with the other two grades in special proportions. Asbestos purchases will be handled by the GSA commissioner in San Francisco, California, and deliveries will be received at the government depot in Globe, Arizona.

Bethlehem Steel Company's Lackawanna steel plant is making new production records almost every month as more units of the $60,000,000 expansion program come into operation. The program is about 65 percent completed, and is the third largest in the world. By 1958 the plant is expected to be using 40 to 50 percent taconite pellets in its blast furnace charge. This would bring Lackawanna's consumption of taconite ore to about 3,500,000 tons yearly, coming from the *Erie Mining Company* operations.

Appalachian Sulphides, Inc., developing the *Ore Knob* copper mine in Ashe County, North Carolina, reports it is drifting in ore on the 700 level, and that the showings are better than drilling had indicated. The new mill will be in operation in February.

Orefraction Minerals, Inc. will build a plant in Andrews, South Carolina for grinding and processing of zircon, rutile, and related minerals. Part of the zircon reportedly will be obtained from the southeast United States, while the balance of the minerals will be imported from Australia through the Port of Charleston.

Illinois Zinc Company has changed its name to *Hydrometals, Inc.* The firm's sheet and strip zinc business will be conducted by the Illinois Zinc Company division of Hydrometals. The company has also completed a merger with *Hayden Projects Inc*, whereby all of the latter's assets will now be acquired by *Hayden Metals, Inc.*, a newly formed and wholly owned subsidiary of Hydrometals. The company plans to construct plants for the production of strip copper directly from copper-bearing scrap using the chemical refining process developed by *American Cyanamid Company* and a powder metal rolling process developed by *Mannesmann Company* of West Germany. One plant reportedly will be the first of its kind to combine refining and fabricating techniques in a continuous process. Because of this revolutionary concept, in which copper in coils re-



Freeport Sulphur Installs Unusual Ship Loader

Freeport Sulphur Company has placed in operation new dock facilities at Port Sulphur, Louisiana, designed to cut by one-half the average loading time for ships and barges. A unique ship loader has been installed on an extension of Freeport's Mississippi River dock at a cost of over $1,000,000. This is the second part of a planned expenditure of $5,000,000 to improve the company's service to its customers. In the foreground, above, the loader is shown filling inland waterway barges. Behind this, the stationary tipple prepares to load an ocean-going vessel. At the end of the ½ mile dock, an insulated barge delivers sulphur in molten form from one of Freeport's mines 45 miles downriver. Designed by Hewitt-Robins in collaboration with Freeport engineers, the loader operates entirely by remote control. The loading operator, from his station on the deck of the ship, is able to move the loader and chute and control the ¾-mile conveyor belt system by means of a foot-square panel of buttons. The giant machine travels a distance of 400 feet on two sets of double rails and moves from one ship's hold to another in less than 5 minutes as contrasted to a half hour or longer if the ship had to be moved. The discharge chute, made to "throw" the sulphur 20 feet in any direction, shuttles out to 45 feet from the dock and can clear an elevation of 54 feet. Last year Freeport installed facilities to load sulphur in molten form for shipment by water to customers many hundreds of miles away. These installations have since been enlarged to meet the growing demand from consumers for this new method of delivering sulphur.

places the conventional copper cake as an end product of refining and in less than a day goes from scrap to strip, important savings in cost are effected.

IRON RANGES

Iron ore shipments on the Great Lakes during the last week of October ran 9 percent ahead of shipments in the preceding week and increased 29 percent over ore shipments in the same week of 1955. Total for this week in 1956 was 2,807,550 gross tons, compared with 2,571,108 in the preceding week, and 2,251,222 in the corresponding period of last year. For the season to November 6th, shipments totaled 68,920,842 tons, or 12,289,909 below the figure of one years ago. The season is expected to close with 80,000,000 tons shipped, compared with 87,000,000 in 1955.

The *M. A. Hanna Company* has announced plans for activating the *Groveland* property near Iron Mountain, Michigan. The deposit involved is a low-grade ore body which will be beneficiated to a high-grade concentrate. The ore is classified as Michigan jasper which is very similar to the Minnesota taconites.

The *Snyder Mining Company* of Chisholm, Minnesota has awarded a contract to the *Western-Knapp Engineering Company*, Hibbing, Minnesota, for construction of an iron ore washing plant. The plant will be constructed at the *Webb* mine near Chisholm, and will treat approximately 200 tons of crude ore per hour.

Construction of a flotation plant for *Jones and Laughlin Steel Corporation* at the *Hill Annex* mine in Calumet, Minnesota, continues. This plant will recover fine iron from the Hill Annex tailings pond. These tailings have been accumulated since 1914, when the plant first began operations.

THE INDEX
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Longyear

For a better drilling operation

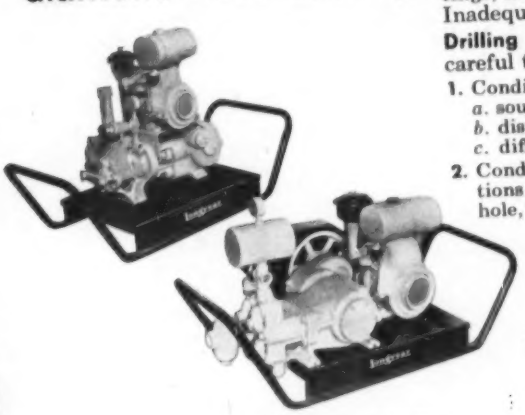
How to select a pumping unit for diamond core drilling

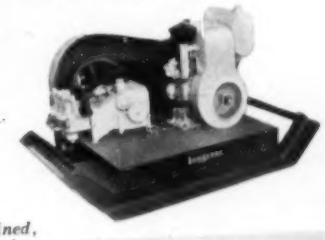
In diamond core drilling the careful selection of the proper pumping unit is of prime importance. Too often the pump selection is an afterthought, resulting in a costly, less efficient drilling operation.

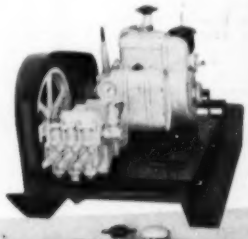
The pump must deliver the proper volume of clear water, at the correct pressure through the drill rods to the bit and back to the surface if the bit is to be kept cool and the cuttings carried away. An insufficient volume of water or inadequate pressure may create a dangerous situation. Cuttings, not properly removed, could trap the tools in the hole. Inadequate cooling might result in the "burning" of the bit.

Drilling Conditions — When selecting your pumping units, careful thought should be given to:

1. Conditions of water supply including:
   - *a.* source of water
   - *b.* distance from water source to drill site
   - *c.* difference in elevation from water source to drill site
2. Conditions under which the drill will be operating, the formations to be penetrated, hole diameter and core size, depth of hole, drill rod size, uniformity of hole diameter, other factors.







SINGLE SPEED PUMPS

The Longyear 307 pumping unit (*Simplex, Ceramic Lined, 300 P.S.I.—7 GPM*) is good for shallow hole coring operations in the smaller sizes. The 307 is an excellent supply pump for remote operation because of its light weight. Under the majority of conditions this unit does not provide sufficient volume to carry out extensive fishtail or drag bit operations.

The Longyear 314 pumping unit (*Duplex, Ceramic Lined, 300 P.S.I.—14 GPM*) is most effective in medium sized coring operations employing considerable rock bitting, and very effective for employing small sized fishtailing operations.

The Longyear 320 pumping unit (*Triplex, Ceramic Lined, 300 P.S.I.—20 GPM*) is good for large sized coring or shallow fishtailing operations. Excellent supply pump for standard water supply conditions.

The Longyear 520 pumping unit (*Triplex, Ceramic Lined, 500 P.S.I.—20 GPM*) is very good for deeper coring jobs, large size fishtailing operations, or where heavier particles are present and where higher velocity is required to flush cuttings. This unit is an excellent supply pump where maximum gallonage required is 20 GPM.

The Longyear 535 pumping unit (*Triplex, Ceramic Lined, 500 P.S.I.—35 GPM*) is designed for operations where greater volumes and higher pressures are required.

TRANSMISSION PUMPS

Pumps with transmissions are demanded by experienced drillers. These units provide the versatility necessary for rock bitting and fishtailing operations, for coring operations to moderate depths, for deep hole coring operations—all conditions satisfied by one pumping unit. These units can be used as supply pumps as well, but size and weight may not fit requirements, in all cases, as would single speed Longyear 320, 520, and 535 units.

The Longyear 520-Q pumping unit (*Triplex, Ceramic Lined*) is the most efficient, all-around pump in that the "three speed transmission" makes possible a number of combinations of volumes and pressures—from 7.9 to 20 GPM's at 500 P.S.I.—Gasoline Powered (also available with Diesel and Electric Power).

The Longyear 535-Q pumping unit (*Triplex, Ceramic Lined*) like the 520-Q permits a number of combinations, but greater volume range is possible with the five speed transmission—from 4.5 to 35 GPM's at 500 P.S.I.—Gasoline Powered (also available with Diesel or Electric Power).

CONCLUSION: Write E. J. Longyear Company, Minneapolis, Minnesota, for illustrated specification sheets on any of the above units.

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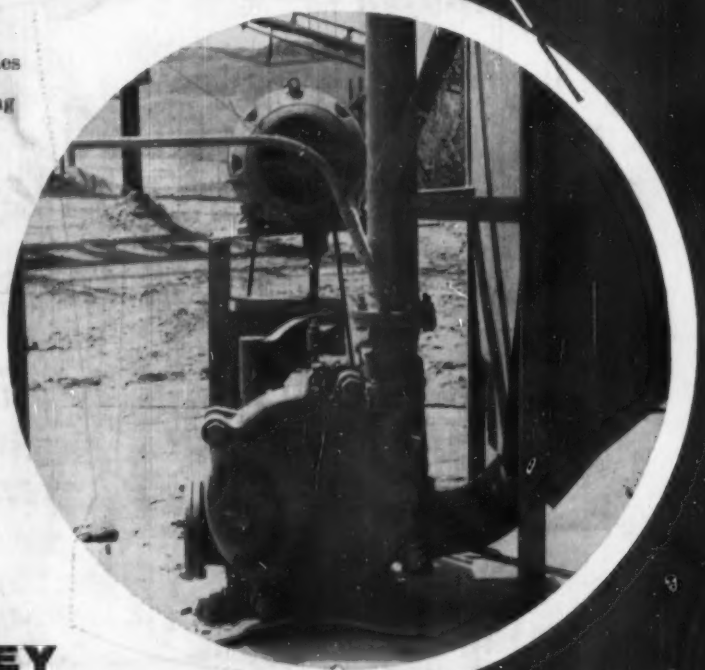
This is one of the many examples of how Wilfley low cost pumping can help you. Write or wire for complete details.



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